The Manitoba School

A Magazine for Classroom Service

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The Manitoba School

A Magazine for Classroom Service

Vol. 1 February, 1931 No. 6

EDITORIAL

NEW HORIZONS

Educational practice is closely bound up with tradition. Both in the matter of the selection of subject matter for the school courses and in the methods followed in the classroom it is difficult to get away from the things our fathers and mothers were accustomed to. The fact that the fathers and mothers are a political force now-a-days, is something also to be reckoned with. That reform in education is needed is freely admitted on all sides, more particularly in respect to the adjustment of the school to the needs of modern life. Just what the plan and content of the new education should be, are, however, matters on which there is little agreement.

We believe it to be a true principle of progress that all learning should be based on child experience. This principle was laid down by Dewey as one of prime importance. Consider it in relation to arithmetic and spelling, which have been called the tyrants of the public school. It is the opinion of a recent authority that most of the "drill", so called, or "mechanized repetition" as it is in fact, in connection with these subjects is worse than wasted effort. For arithmetic practice in the lower grades, teachers in large numbers are now turning to the use of practice books by which the pupils may test their own progress and accuracy. It is also advocated that drill be replaced by practice with concrete numerical quantities for the first three years of school. Spelling lists, in a similar way, are thought by many to be of doubtful value. Of more importance is the ability to spell correctly whatever words may be required from time to time in the pupil's written work.

A second principle we would urge here in the brief space at our disposal. It is this, that all the year's work should, as far as possible, be laid before the child, so that he may work at it independently, and study if he desires,

ahead of the class. In is in this connection that we justify, and in fact, strongly recommend, the use of our manuals by the pupils, since they are designed to cover the courses with which they deal, both in respect to subject matter and problems based on the course.

CURRENT TENDENCIES IN THE SELECTION OF CONTENT AND IN THE METHODOLOGY OF SECONDARY SCHOOL SUBJECTS

M. E. LAZERTE, M.A., Ph.D.

ALGEBRA

There are several ways in which one may arrive at fairly satisfactory methods of teaching any subject. In the opinion of experienced teachers one is likely to find many points of agreement which may be accepted as good practice. From a study of text books one may obtain the common elements and these give a sort of highest common factor in the thinking of those qualified to write text books. From observation of class room practice one may get detailed information concerning the difficulties pupils have in mastering each topic taught. Finally from a study of pupils' errors in oral and written examinations and tests, one may compile a fairly complete list of the points which present difficulties to the pupils. When the pupils' difficulties are known, methods of instruction may be devised to correct and prevent them. The writer favors a methodology built up in this latter manner. Methods so derived are not the mere opinions of an instructor. They are the means that may be used to assist pupils in mastering the subject. Valid methods must be based upon psychological analyses. Educational psychology is not an extra in teacher-training courses, but is a basic subject.

Unfortunately, there has been little systematic analysis of pupils' difficulties in learning algebra. The few studies that have been made indicate that the truly basic difficulties are rather few in number and that these appear again and again in cumulative fashion.

It is natural to ask why algebra is a very difficult subject for the majority of high school pupils. We know that on final examinations the algebra tests are the cause of many failures.

Nature of the Subject

Suppose we say algebra is generalized arithmetic. To the extent that it is generalized the pupil must think of

elements common to many arithmetical situations of a given type. Wherein does the problem, "Find the cost of **x** pounds of sugar at A cents per pound" differ from the problem, "Find the cost of 7 pounds of sugar at 5 cents a pound"? In the latter problem the pupils need only think of 5 cents multiplied by 7, but in the former he must generalize his thinking and master the idea "the A cents, whatever its value may be, must be multiplied by X, which may also have different values from time to time." These two types of thinking are quite different. How often this difference is brought to our attention. A Grade IV pupil is experiencing a similar though simpler difficulty when he is asked, "How do you find the cost of a gallon of milk if you know the cost of a pint of milk?" even though he may be able to think clearly about the problem, "If a pint of milk costs 8 cents, find the cost of a gallon." In the algebraic type of thinking there is an abstraction of certain elements followed by a general application of this abstraction covering innumerable particular cases.

The ultimate use of algebra is computation. The truth remains, however, that as the subject is presented in our texts at the elementary levels, the final purpose is lost sight of and emphasis is placed upon the form of results. In $(a+b)^2=a^2+2ab+b^2$, $(x+y+z)^3$, $(a-3b)(a+b)$, $(a+b)(a-b)$ etc., it is the general truth and the symbolic language it which it is stated that receives nearly the sole emphasis. The fact that the language used is new to the pupil is the source of many of the learners' difficulties. After carrying through artithmetical computations in which the symbols are the digits, 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 which have definite meanings, the pupil now carries his thinking along with the aid of new symbols such as x, y, z, a, b, c, x^2, -5, a 1/3, etc. To the mature student it is an advantage to be relieved of the particular values which would characterize any particular application.

Because the particular values are not carried along in the general algebraic thinking an added difficulty arises in the fact that there is no ordinary and familiar method of checking the accuracy of the thinking. Of course, there are relationships that may be used as checks, but the elementary student does not see them, and he must suspend judgment concerning the accuracy of his thinking and computation until he comes to some milestone along the way.

Without stopping to discuss at greater length the natural difficulty of the subject, we pass on to consider the same topic from the pupils' point of view.

Common Difficulties of Pupils

One of the first facts impressed upon anyone studying

pupils' errors is that there are a large number of conventions which must be understood and used by the pupils.

The bracket is a symbol in which is condensed the meaning that would be conveyed by a whole sentence. It is not a fact of nature that x multiplied by y should be xy. The product might have been written $\frac{x}{y}$. There is nothing in the instructive equipment of the child that makes him sensitive to conventions that have been evolved in racial history. Why should x times x be written x^2? When the child is confused by the form xyz, or hesitates when finding the product of x, y and z, let us remember that all his former training has led him to believe that 56 means fifty-six, not 5 times 6, and that 789 has never meant $7 \times 8 \times 9$, but rather seven hundred and eighty-nine. Why does $a^3 \times a^4$ equal a^7 give difficulty? If a pupil understands the basic convention that $a \times a \times a$ will be written a^3 the a^7 follows naturally if one is logical. To prevent the pupil from correct reasoning is the habit of seeing a 3×4 in the $a^3 \times a^4$ setting.

Directed Numbers

The section on positive and negative numbers is usually inserted in the text too early. If it appears early in the text the teacher may postpone teaching of the topic until the laws and conventions used in operations with literal numbers are mastered.

There should be only an average amount of difficulty with directed numbers if the idea "direction" is associated with the plus and minus symbols used. The thermometer scale, assets and liabilities, stairs going up and stairs going down, and the simple line graph, may all be used to give meaning to +3, —2, +10, —5, etc. It takes more than one day's teaching to give the pupils a working familiarity with the simplest notion of positive and negative number.

When operations with these numbers are begun, many difficulties may be avoided if the teacher will be careful in his choice of words. It means little to a pupil to hear "Subtract —4 from —1". He may be greatly aided by the instruction, "How far is it from —4 to —1?"

From the simple line graph

6 5 4 3 2 1 0 1 2 3 4 5 6

— direction - - - - - - plus direction.

The pupil will understand that the sum of +3 and +2 is +5, that the sum of ×3 and —4 is —1, that the difference between the two numbers —5 and —2 is either —3 or +3, depending upon which number is the subtrahend and which the minuend.

Greater difficulty is experienced in teaching multiplica-

tion and division. It is assumed that no teacher will wish to give students meaningless rules, because experience has shown that pupils so taught fail to do their mechanical work accurately, and that they have no conviction of the reasonableness of our conventions. Pupils who rely upon rules make mistakes such as the following:

Operation	Example	Result
Addition	+4a —3a	—7a

Explanation: A minus and a plus give a minus.

Operation: Subtraction.
Example: —a
—3a Result: +4a.

Explanation: Like signs give plus.

How may one teach multiplication and division? Use the linear scale for addition and subtraction.

5, 4, 3, 2, 1, 0, 1, 2, 3, 4, 5, 6

Use the idea of direction with each of the two factors in $(+3)\times(+4)$ and apply to the formula

$$S = v\,t.$$

The number of units of distance travelled is the product of the number of units of velocity and number of units of time. Give to $(+3)$ and $(+4)$ meanings that fit into this formula.

Let zero time be 12 o'clock noon on any given day.

$+3$ will mean a velocity formula of 3 miles per hour. $+4$ will mean 4 hours after 12 o'clock noon.

S in this example is a distance of 12 miles measured from 0 in the positive direction.

In the same way:

$$(+3)\times(-5)=-15.$$
$$(-3)\times(+7)=-21.$$
$$(-4)\times(-9)=+36.$$

For division one may take the problem as one of finding a missing factor:

$$(-15)\div(-3)$$
$$(-3\times(?)=15.$$

From the earlier work in multiplication the result $+5$ is readily deduced.

Use of Formula

The meaning of the formula $C=\frac{E}{R}$ for example is de-

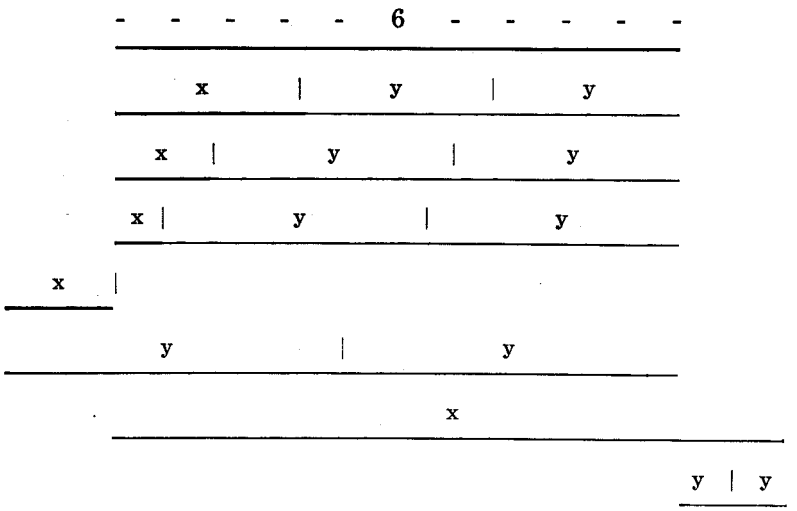
pendent upon an earlier understanding of literal numbers. $C=\frac{E}{R}$ expresses a relation between literal number irrespective of the notions in physics from which the formula is derived. In evaluating the formula the correct units must be chosen. In text-books examples, the formula is given and the units are named. The pupil is asked to verify the formula. The majority of pupils go through the motions with the pencil that are necessary to verify the formula, but true verification is impossible because the formula was never understood.

Variables and Constants

Many students, if they know the difference between constants and variables, are not able to identify each when it is presented. It is a matter of agreement that a, b and c fulfill one function and that x, y and z fulfill another. When an equation such as $x+2y=6$ is given, the pupils may recognize x and y as variables. The significance of the fact that they are mutually dependent variables, may not be grasped.

It is one matter to think of a value of y corresponding to some given value of x, but it is quite a different matter to see the continuity of the changes that take place in the values of x and y.

To what extent will the capable students see the continuity in and implication of the facts represented below:



Practice in filling in a table such as the following will

results in rather definite notions concerning the variability of the unknown:

$x+2y$	x	$2y$	y	
6	1	5	$2\frac{1}{2}$	$1+(2\frac{1}{2}\times 2)=6$
6	2	4	2	$2+(2\times 2)=6$
6	-3	9	$4\frac{1}{2}$	$-3+4\frac{1}{2}\times 2)=6$

Etc.

Graphical representation throws additional light upon the meaning, of the equation, $x+2y=6$. After axes are chosen and the plotting of points has continued for some time the pupil is certain to see that there is law and order expressed in the given relationship.

Simultaneous Equations

The pupils' ideas concerning simultaneous equations might conceivably be limited to the routine of multiplication, subtraction, and division, whereby values for x and y are obtained. Ordinary examinations test only proficiency in this routine. The pupil whose ideas concerning $x+2y=6$ are enriched is able to grasp a rather full significance of what one means by combining $x+2y=6$ and $2x+5y=13$ in various ways to deduce values of $x=4$, $y=1$.

After plotting points for $x+2y=6$, and also for $x+2y=13$, the pupil might naturally think of the possibilities of chance determination of a point common to both groups. Without locating such a point, one might hazard a guess as to its position in the quadrant. From the mechanical work of "solving" the equations, one would return to the graph to verify the earlier guess.

It is evident that there are wide latitudes within which one may carry through the work on equations. Certain methods of treatment give rich and varied meanings; others give but few. Methods followed will be adapted to pupils' capacity. We are arguing indirectly here against the mechanical "solving" of equations which emphasizes routine and fails to give knowledge and appreciation of relationships.

Language Difficulties

In each subject of the school curriculum there is a vocabulary peculiar to that subject. These special vocabularies and statements of law, cause many difficulties. Of the many such difficulties the following are examples: Irrational number, irrational surd; negative number, a number preceded by a minus sign; when removing brackets, the negative sign in front of the bracket changes all signs within the bracket.

In $(-4)\times(-4)\times(-4)$ one pupil said, "In multiplication, like signs give plus and unlike signs give minus. All the signs in this question are plus."

Suggestions

1. Pupils must understand very clearly the meanings of all basic terms, symbols and conventions.
2. More time should be spent on early portions of the work to ensure a more adequate understanding on the part of the pupil.
3. Different concepts should not be taught too near each other, as for example, literal number, negative number, exponent.
4. Definitions should not be given for difficult terms and notions.
5. Postpone for some time the treatment of directed number.
6. Use geometry and arithmetic to supplement and explain or illustrate, algebraic concepts.
7. Prevent memorization of definitions and techniques until the pupils have an adequate understanding of the topics under consideration.

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ARITHMETIC

M. E. Lazerte, Ph.D.

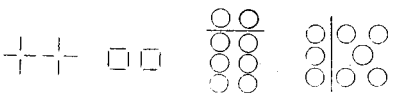
GRADE I

FEBRUARY OUTLINE

(a) Recognition of groups that make 8.
Seatwork exercises on grouping.
(b) Counting by 10's to 100.
(c) Counting by 5's to 100.
(d) The use of ½ (orally).
(e) Exercises based on the number chart.
(f) Combinations and separations.
(g) Problems.

Groups

The group eight may be considered in any of these forms:



On the bead frame the natural grouping is:

which suggests not only 5 plus 3, but also the serial position of 8 relative to 10.

For seatwork exercises following grouping, give drill in forming totals as named. The pupils have the totals on their desk, or paper arranged as follows:

5	6	7	8

On the edge of the desk, or somewhere within easy reach the pupils should have duplicate number cards as follows:

When the total 8 is given the cards are arranged over the required total, thus:

2		4		7
6		4		1
—	or	—	or	—
8		8		8

Group Counting by 10's and 5's

Counting by both 10's and 5's will be easy from the chart given on page 12 of last issue. Include the following:

(a) Pointing to the 10 position in the series, to the 20, to the 30 ..... etc.

(b) Pointing and naming in succession, 10, 20, 30 ..... 100.

(c) Pointing and naming in succession, 100, 90, 80, 20 and 10.

(d) Naming in mixed order when pointed out, 30, 10, 70, 50, etc.

(e) Giving orally: 20 plus 10, 40 plus 10, 60 plus 10, 70 plus 10, etc.

(f) Giving orally: 70—10, 30—10, 100—10.

(g) Pointing to 5, 10, 15, 20, 25 when named.

(h) Pointing to and naming in succession 5, 10, 15, 20, ... 85, 90, 95 and 100.

(i) Pointing to and naming in succession 100, 95, 90, 85, 80, 75 ..... 15, 10, 5.

(j) Naming when shown in mixed order, 5, 45, 95, 55, 65, 25, etc.

(k) Giving orally, 5 plus 5, 25 plus 5, 45 plus 5, 55 plus 5, 85 plus 5, etc.

(l) Giving orally 30—5, 60—5, 100—5, 50—5, etc.

Exercises such as the above must be continued and reviewed through two months. Remember that the numbers are not on the chart and each step must be thought through.

Use of ½ Orally

Begin with activities such as the following:

(a) Finding ½ of a piece of string. Insist on accuracy.

(b) Attempt same division of long straws or slender sticks. Check accuracy. Reject results of inaccurate attempts.

(c) Find ½ of a circle.

(d) If equal arm balances are available, divide cupfuls of sand into halves.

(e) After the basic idea is established proceed to finding ½ of given lines that are easily measured. Take lines 6 inches, 4 inches, 2 inches and 10 inches in length.

(f) Find ½ of an even number of objects by putting one in each pile in succession until all are distributed.

(g) Let exercises (e) and (f) lead directly to giving orally, ½ of 6, ½ of 10, ½ of 4, ½ of 8.

Combinations and Separations

Unit 3 in the Primary Number Booklet is a review of units 1 and 2 in mixed order.

Unit 4 is as follows:

2	3	2	5	5	4
2	2	3	5	3	2
4	5	5	10	8	6

It seems natural that the

3	2	5	5
2	3	5	3

could be taught easily from the individual bead frame or from the number chart. The

2 and 4
2 2

suggest the series of even numbers and counting exercises based thereon.

The subtraction facts of unit 5 are closely related to the facts of unit 4. They include:

5	5	10	7	6	8
—2	—3	—5	—2	—2	—3

PROBLEMS

1. I have a five cent piece in each hand. How much money have I?
2. Fred had 5 apples. He ate 2. How many has he left?
3. I have ten cents. If I spend 5 cents for a pencil, how much money will I have?
4. Hary and Jenny each have two dolls. How many dolls have they altogether?
5. Tom had 8 marbles. He gave 3 to Harry. How many has he now?
6. There were 5 buttons on my coat. Thre of them were pulled off at recess. How many buttons are left on my coat?
7. I found two birds' nests today. There were 5 eggs in one nest and 3 eggs in the other. How many eggs were there in the two nests?
8. Dick put 3 tin soldiers in one row and 2 others in front of them. How many soldiers were there in the two rows?
9. Tim had 6 rabbits but two of them ran away and did not come back. How many rabbits has Tim now?

10. We have 4 black kittens and 2 white ones. How many kittens have we?
11. Jim shot at a target 7 times. He missed it twice. How many times did he hit it?
12. I have a two-cent stamp and a three-cent stamp. How much are the two stamps worth?

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SILENT READING

D. J. Dickie, Ph.D.

READING IN GRADE III

It is the function of the primary grades to teach the pupils how to read, that is, to train them to make the physical and mental adjustments involved in recognizing and interpreting words and sentences. As has been pointed out, there are four fundamental elements in this process: the realization that reading is thought getting; the fusing of words into phrases and sentences and the interpretation of the same; word and phrase recognition; and eye movement. It is the object of the teacher to inculcate correct habits in these four elements by the time the pupil is ready to leave Grade III. Diagnostic and remedial work in the primary grades should, therefore, concern itself with testing the pupils, diagnosing their weaknesses, and by remedial exercises bringing them up to standard in the fundamental habits.

Time Allotment

Pupils in the grades from I to III should spend at least ten minutes a day in drill lessons, and at least twenty minutes in seatwork designed to improve their reading habits.

Standard Tests

Accurate work for improvement in reading is based on tests which are given periodically, the records of which are kept and compared. On entering a new grade all the pupils should be given a standardized reading test. The Burgness Scale, the Haggerty Reading Examination, The Gates Primary Reading Test, and Gray's Oral Reading paragraphs are the tests most used by primary teachers.

Comprehension and Rate

Having given any one of these tests, the teacher is able to divide her class into two groups: those whose reading is up to standard and those who fall below. Pupils who fail to make a proper score on a standardized test may do so either because of poor comprehension or poor rate. The teacher should next, therefore, give her poor readers a series of informal tests to find out whether they are weak in comprehension, or in rate, or in both. To test the pupils' comprehension the teacher should prepare some simple questions or a story of reasonable length and difficulty, and have the pupils read the story and answer the questions. This should be done several times, and an average score struck. To test the pupils' rate, the teacher should seat the

pupils comfortably with a story of suitable difficulty, and have them read for a minute or two. At the word of command the children mark the word on which their eyes rest and read steadily on. When one minute has passed, the teacher calls "time", and the children again mark the word upon which their eyes rest. They then count the number of words read in the timed minute. This should be done several times and an average score struck. This scale should be compared with the number of words per minute which the grade should read. (See Appendix A for description of these tests).

Grouping

As a result of these informal tests the teacher will be in a position to classify her pupils. Ordinarily she will find that she has three groups: those who are poor in comprehension and good in rate; those who are good in rate and poor in comprehension; those who are poor in both. Each group should be given the remedial drills which it requires. If the teacher prepares a set of drill exercises and a set of seatwork exercises for each group, she is able to drill one group while the others work at their seats, and so get round the three groups in turn. As drill lessons in primary grades should not be longer than ten minutes, half an hour is required for the day's drill in reading. In this time each group has ten minutes' drill and twenty minutes of reading seatwork.

Causes of Poor Comprehension

In order to prepare effective drills and seatwork for her class, the teacher must know exactly what weaknesses hinder the children's progress. In remedial work, it is a waste of time to proceed blindly, for the extra drill may be fixing the very fault which it should correct.

The remainder of this article will be devoted to the discussion of the causes and remedies of slow rate in reading, leaving the whole of the March article for the discussion of the causes and remedies of poor comprehension, the more serious of the two weaknesses.

Slow rate in reading may be caused by poor eye movement, which may be accompanied by lip movement or pointing with the finger to each word. Using the oral reading rate for silent reading is a common cause of slow reading; poor word recognition and poor comprehension are its most serious causes.

Poor eye movement should be corected by flash card exercises. Other exercises to cure this fault are suggested below. Lip movement and pointing are physical habits, and should be corrected physically. That is, the pupil should be reminded not to use them, and if necessary required to put his finger on his lip, or his hand behind his

back while reading. Using the oral reading rate is corrected by giving the pupil a great deal of very easy silent reading to do, and requiring him to do it in a given time.

Poor word recognition is the most serious cause of slow rate in reading; it is also a prime factor in poor comprehension. In working to improve word recognition the teacher should know just what difficulty impedes the child. It may be caused by lack of intelligence, by a small or inaccurate spoken vocabulary, by lack of practice in word recognition, by poor habits of attacking new words. Little can be done about lack of intelligence. The pupil's spoken vocabulary will be improved by the reading, story-telling and conversation lessons, by all the activities of the school. Practice in recognition will be given in the reading drill lessons. Poor habits of attacking new words requires special attention however.

A reader recognizes a new word in either one of two ways: he may guess it from the context, or he may study the form of the word, spell it, or phonicize it, and try to connect it with some word already in his vocabulary. It is one or other of these habits that slow reading children are generally found to be weak. Teachers should begin early in the first year to guide pupils' practice in making out words from the context. Sentences composed of known words with one unknown word form an interesting and useful reading game. Average as well as first grade children will get such a word as: "The baby 'drinks' milk." As this is the ordinary adult way of finding out the meaning of strange words, exercises in using it should be given regularly throughout both primary and intermediate grades.

The experienced teacher can frequently tell without testing just what mechanical difficulty troubles the child, but the following tests may be of use to the inexperienced. They are informal tests. No marks are given for them and no standard is set by them. As the pupil reads over the lists, the teacher watches him and notes his weaknesses, so that she may give him specific drill on the skill needed. These lists, except "B", have been prepared by choosing certain words from the Gates Primary Word Lists, but the teacher can easily make lists of her own which will serve the same purpose.

— A —

To discover whether the pupil can recognize words as wholes without spelling or phonicizing them. Have pupils pronounce the words in the list, noting any tendency to spell or phonicize.

cradle	lunch	squirrel	color
please	pretty	around	because
breakfast	Indian	pencil	uncle
caught	dirty	hungry	along

bottle	kitchen	queen	ticket
knock	surprise	square	north

— B —

To discover whether the pupil knows all his phonic sounds. Children are frequently found who are unfamiliar with this or that sound, the lack of which handicaps them seriously in making out new words. Have the pupil sound each word first and then pronounce it.

mat	hop	chick	seem	fork
mate	hope	slam	boat	her
rain	time	yes	tried	bird
call	mad	queer	full	burn
Jap	sham	that	seat	now
tag	blame	kiss	play	loud
lad	red	will	too	phone
fat	thin	six	pry	cough
pin	when	moon	dew	laugh
pine	shall	nose	car	bring
comb	knife	station	honest	light
corn	zipper	boy	care	face

— C —

To discover whether pupils can blend. Pupils are frequently found who know all their phonic sounds, yet lack power to blend them together into words. These words have been chosen as test words because they seemed likely to belong to the pupils' spoken vocabulary, but unlikely to be found in his reading vocabulary. Being familiar to his ear, he should be able to pronounce the word correctly when he has put the sounds together.

trout	carrot	Dutch	mirror
rack	parade	steering	handsome
petal	factory	whisper	pumpkin
cheese	hotel	peanut	thresher
circus	airplane	cabbage	marmalade
monkey	telephone	harrow	cocoanut

Exercises to improve rate of reading:

1. Sentences to give practice in getting words from the context.
2. Phonic and blending drills.
3. Flash card exercises to give practice in recognizing words and phrases as wholes.
4. Reading very easy material.
5. Re-reading stories already read. These two exercises improve eye movement.
6. Reading to find the answer to a single question.
7. Reading as fast as possible for one minute; then discussing what has been read.
8. Reading an exciting story.
9. Reading races. (Test comprehension.)

COMPOSITION AND LANGUAGE

A. J. Watson, B.A.

GRADE III

LESSON XCVI

STORY FOR REPRODUCTION

The Friendly Box

Janie had never had a litle girl neighbor, for the farm she lived on, like the others about it, was very large, so that there weren't many neighbors at all! When she was eight years old, a part of the land belonging to the farm nearest her father's was sold to a man from the city, who promptly had a house built on it. Janie watched the carpenters every day at their work, hoping all the while that a little girl would live in the new house. And when it was finished, a little girl just Janie's age, really did come there to live.

From the very first, Janie and Ellen were friends. They would like to have played together every minute of every day if that had been possible, but each little girl had to help her mother part of the time. Summer is a busy time on the farm, and little girls can be a real help.

Almost every morning Janie and Ellen, working about the house or garden, made the most wonderful discoveries they simply longed to share with each other. It was hard to keep on picking berries, or getting in vegetables when one has just discovered baby birds in a nest, or found the first rose of the summer. Each girl thought if she could just tell the other, then she would really enjoy seeing how nicely she could complete her work.

It was Janie's mother who made a suggestion. "Wouldn't it be great fun," she began, "if you and Ellen could have a mail box half way between the two houses? Then if you have something you wish very much to tell each other, you might write a little note about it, having first arranged a signal to show that the note is there."

Janie thought this a wonderful plan, and when her work was finished she ran eagerly down the road to Ellen's to tell her about it. Ellen wanted to put up the mail box that very afternoon, so a search was begun for the necessary material.

A pasteboard box was rejected because it would become rain soaked, and a suitable wooden box being hard to find.

Ellen's mother offered a bucket with a lid. The girls declared this just what they wanted, and ran with it to a carefully measured fence post, which stood just half way between the two houses. The bucket was nailed securely to the fence post and was ready to assume its new place in the world.

"Let's call it the Friendly Box," suggested Janie suddenly, and Ellen agreed happily.

The question of signals arose next. Ellen suggested blowing a whistle as loudly as possible, while Janie's idea was to hoist a banner whenever a note was mailed. As usual, they compromised, and decided to use both signals.

The Friendly Box proved to be all that its name implied. Not only were interesting little notes left there, but many little surprises as well. There was, for instance, the morning Janie helped make cup cakes, icing them, all herself. Of course one of them, mysteriously wrapped in tissue paper, found its way into the Friendly Box for Ellen. The next morning there was a cookie-boy for Janie with a little note saying Ellen had rolled and cut out all the cookies for Mother and had made a cookie-boy for Janie and herself. The afternoon Janie sewed with Mother she made a dainty little handkerchief to slip in the Friendly Box for Ellen.

And so the work and fun went on all through the summer. In a week it would be time for school to start and Janie and Ellen would ride off every morning in the school bus. Ellen and her mother were especially busy because relatives from the city were coming to spend a few days with them. For a time Janie did not see her friend at all. There had been a hurriedly written note one morning from Ellen, saying Auntie Lou and Uncle Frank had come, and that there were ever so many things she could do to help Mother, so that Mother might have more time to visit with them.

Two or three lonesome days followed, and then the welcome signal appeared above the Friendly Box. When Janie reached the Friendly Box, she found the lid off, and standing straight up in it, holding its arms out to her, was a dear little baby doll! Janie could hardly believe here eyes. Surely, Ellen didn't mean it for her!

Just then there was a joyous cry and Ellen jumped out from behind a shock of hay where she had been hiding. And she was holding a doll exactly like the one in the Friendly Box! "Auntie Lou brought me both dolls. They're twins," she explained, "and I thought it would be more fun if we both had one. Let's make dresses for them," and soon scissors and needles were busy, with two little girls stitching happily away.

Oral questions:

What was the Friendly Box? Who made it and why?

What chores did each girl have to do at home?
Why did they need a mail-box? Where was it placed?
What did they put in it besides letters and notes?
What signals were used? What was the better one?
What stopped the girls from using the box for a while?
What was the biggest surprise of all?
Who had given Ellen the dolls?
What did the girls get busy and do right at once?

Seatwork:

Tell how you and your friends could use the same kind of mail box. Tell what you would put in it and what surprises you would have for your friends.

Put a mail box up in your school room. Write and mail letters to your best friend in the class and at four o'clock have a postman deliver the letters.

LESSON XCVII

Put in at least two describing words:

1. I see the ..... grass.
2. Mary has a ..... doll.
3. Read us that ..... story.
4. We saw the ..... sunset.
5. He is a very ..... boy.
6. Tom likes to read ..... books.
7. He went through the ..... forest.
8. They have a ..... dog.
9. Where has my ..... pencil gone?
10. We shall go to that ..... house.

LESSON XCVIII

PICTURE STUDY

The Goat and the Gig

Oral discussion:

What animal have the children hitched up?
What sort of carriage would you call this?
Where do you think the children are going?
How long would it take them to go a mile?
What makes it easy for the goat to draw the gig?
How do you know the children are having lots of fun?
What does the goat think about it?
What will the children's friends want to do?
What will they feed the goat after the ride is over?

Seatwork:

Name all the animals you can that are used for drawing carts or loads of any kind. Tell about hitching up your dog or pony and what fun you had going for a ride.

LESSON XCIX

CONVERSATION STORY

St. Valentine's Day

Oral discussion:

Talk about when it comes, why we keep it and what we do on that day. Tell about your Valentine box and the party you had at school. Read the story from Book III Reader.

Seatwork:

Write a story about St. Valentine's telling who he was, why the children liked to see him, what the people expected from him and how his messages were carried.

LESSON C

Rode—Road

Teach the correct meaning and spelling of each. Put in the correct word:

1. He _____ on the right side of the _____.
2. Where is the _____ along which we _____ the pony.
3. I know the _____ on which they _____.
4. The muddy _____ is not a good _____ to take.
5. Mary _____ her pony the same day I _____ mine.
6. We _____ the car along the rough _____.
7. Tom _____ past us on the dusty _____.
8. Which _____ did he take when he _____ to town?

LESSON CI

STORY FOR REPRODUCTION

One autumn afternoon three children came out of school. "It's going to rain," sighed the biggest one. "I'm so cold," wailed the littlest one, buttoning up her coat. and

the middle-sized one gazed dismally along the straight white road and said nothing. They trudged along in silence, and then something happened. They heard a car behind them. "They might pick us up," said the littlest one hopefully. "It's Mother," cried the middle-sized one delightedly, and as Mother put on the brakes and drew slowly to a standstill beside them, the three children joyfully climbed into the car.

"Just peep in the back and see what I've brought for you," Mother greeted them cheerily. "A cuddly puppy!" cried the biggest one. "Oh, the darling!" cried the littlest one. "Isn't he a dear!" cried the middle-sized one, and they nearly smothered a ridiculously small puppy that had been cuddled in a box on the floor.

"What shall we call him?" asked Mother, when they reached home. "Towser," cried the biggest one. "Prince," announced the littlest one. "Trixie," said the middle-sized one, jumping up and down. "He wags his tail so, and we'll teach him lots of tricks."

"Yes, yes," they all agreed, "and he waddles, too. Let's call him Trixie Waddles Wagtail," and so that became his name, and what a wonderful adventure life was to him.

First he had a big bowl of warm bread and milk all to himself, instead of having a scramble for what he could get among several other fat, waddly puppies. Then he was given a bed in a corner of the garage.

Next morning when the doors were opened, in walked speckled hens and proceeded to scratch Trixie's hay bed in all directions. "This is fun," he thought, "I'll play, too." He soon tired of scratching hay around, and hopping on three paws, he playfully tried to strike at one of the hens with the other. The hen walked away, so he tried to play with the others, but they all walked away in a stately procession, Trixie following as fast as he could. But the faster she struggled after them, the faster they trotted ahead, when suddenly out of the kitchen door came Mother.

"Oh, Trixie," she cried, "you mustn't chase my hens," and Trixie ran up to her, and woofed and wagged his glad little tail, and tried to explain that he only wanted to play with them, but they were unkind and would not stay. "There, Trixie," said the Mother, patting his small fat sides, "I know you mean to be a good puppy," and then the children came trooping out, and he was cuddled and petted and fed, till they ran off to school.

Trixie felt rather lonely, so he cocked his small head on one side and sat very still, and wondered what he could do, when out walked the cat. Now you must remember that this was the first cat that Trixie had ever seen, so being a glad friendly puppy, he wagged his glad little tail

and bounced toward Pussy. Now Pussy was also a friendly little person, but she had never met a doggie before, so when this rollicking puppy bounced roughly up against her, she arched her back, bristled her hair and took one leap to the window sill. Poor Trixie boldly jumped after Pussy, but he fell short and tumbled all of a heap onto the beautiful aster bed, and there Mother found him with all the gladness gone out of his little puppy heart.

"Oh, Trixie, you're sitting on my lovely mauve aster! How could you?" exclaimed Mother, and Trixie, who had begun to get glad again at the sight of Mother, and stood up on his wobbly legs, sat down again, right on the poor mauve aster, and let out one piteous forsaken puppy wail.

"You poor little thing," cried Mother, "I think you're lonely without the children," and she picked up the forlorn mite and cuddled him. Now being a cuddly pup, that was the very thing to revive his dampened spirits, so Trixie waggled his little puppy tail and legs and head all at once. "Now, Trixie," said Mother, trying to speak severely, "you must not walk on the flower beds. Are you sure you'll try to remember?" Again he waggled the whole of his small self, which was his way of saying he would do anything at all to please, if only he could be loved and cuddled. Soon the day went by, and at the first glimpse of the children coming down the lane from school, a cuddly puppy ran to meet them as fast as his short legs would carry him.

Oral questions:

What were the children's names?
What story does this remind you of?
Where and how did they find the puppy?
What was his full name?
What did they feed him and where did he sleep?
What fun did he have with the hens?
With the cat?
What harm did he do to the aster bed?
How did he act when he was pleased?
Why did they call him a cuddly puppy?

Seatwork:

Write a story telling how you got a puppy for a present, how you fed him and took care of him and what tricks he learned to do?

LESSON CII

THE STORY OF A PROVERB

Explain the meaning of the word in simple language.

Oral:

In the conversation have the children tell different say-

ings they have heard people use. Make a list on the board as—

Practice Makes Perfect.
A Stitch in Time Saves Nine. Etc.

Explain why each is called a proverb. Have the children tell what they think each means. Have them show how each might apply to them in their school work or in their play.

Seatwork:

Write a story in your own words telling how "Practice Makes Perfect," in writing, in playing marbles, in pitching ball.

LESSON CIII

PICTURE STUDY

Oral discussion:

Where do all these children live? What have they been helping the grown-up people do? (Probably planting potatoes or corn.)
How many children are there? What are they riding in?
Where are they going? Do you think they are having a race?
What would happen if the wheelbarrow struck a clod or stone?
How do you know they are all having a good time?
What day of the week do you think it is? Why?

Seatwork:

Tell about helping to plant potatoes in your garden or on the farm. Tell what month the planting is done. Tell how the ground is made ready and how we use horses and plows in this country instead of wheelbarrows and hoes.

LESSON CIV

CONVERSATION STORY

Dutch Children

Oral:

Talk about the country they live in; about the dikes, canals and windmills. Tell what these children do in summer and in winter. Tell what we get from Holland. Read parts from the book, "The Dutch Twins."

Seatwork:

Pretend you are a little Dutch boy or girl. Tell four things about yourself and your country.

LESSON CV

Threw - Through

Show the difference in meaning and teach the spelling of each word.

Put in the correct word:

1. Harry _____ his ball _____ the window.
2. I _____ the snowball _____ the door.
3. We will go _____ this door to get _____ the building.
4. The children _____ the stones _____ the holes in the fence.
5. I went _____ the yard before I _____ the ball.
6. The circus man _____ tickets as he rode _____ the town.
7. John _____ his fishing line _____ a hole in the ice.
8. The girls _____ their skipping ropes _____ the air.

LESSON CVI

STORY FOR REPRODUCTION

Sunshine

While walking down the main street of a southern city, I was one day attracted by the faint "peep, peep" of a bird of some kind. We looked all around us, but the street being thronged, we were for some time unable to discover the bird.

At last, looking through a grating in the sidewalk that gave light to a cellar, we saw a young sparrow that had evidently fallen from its nest.

We entered the store and asked the proprietor if we could go down to his cellar to rescue a young bird that had fallen through the grating. He consented and we descended a pair of creaking, rickety steps at the back of the store that led to the cellar.

The young sparrow had, we found, fallen on his side and broken one of his legs, so we picked him up and took him home with us, and cared for him.

He mended rapidly and soon could get about again. And then one day to our joy he flew about the room. We called him Mike and he answered to the name like a dog, even flying to me when I called him from a group of fellow sparrows.

We never caged him; we wanted him to be free. And so one day he flew out of the window. But much to our surprise and pleasure Mike returned. He grew entirely out of his fear of mortals and would go to anyone, even to a perfect stranger. He would fly away every morning but always came home at night.

Mike had some odd tricks. His chief delight was to get inside the face powder box and dust himself. And how we laughed at the sight! We had a canary at the time, and sometimes we use to put Mike in the cage with the singer. It was an amusing sight to watch them. Mike was for making friends with yellow warbler at once, but try as he would he never succeeded. The canary absolutely ignored him. Mike would watch the canary crack his seed, and then try to imitate him. But his little bill was not built to crack seed, so after innumerable futile attempts he gave it up as a bad job.

But he learned to watch his chance and then, like a flash, he would seize the kernel out of the canary's bill before the latter could swallow it. How we laughed!

Mike received quite a little notice in the newspapers at the time, and we received many flattering offers for our feathered friend. But we refused them all. Mike was, we explained, a free agent, free to come and go as he would. We would never consent to his being caged. But one day our little friend disappeared and never came back. Possibly he and a little mate set up housekeeping together. Friendly little fellow, we hope you are free—free to roam the sky at will. You were a ray of sunshine indeed to one sadly in need of cheer.

Oral discussion:

What happened to the bird? Where was it found? How did they get it out? What did they call him? How soon did he get better? What did he do right away? What did he do when they let him outside? What tricks did Mike learn? What do you mean by "notice in the newspaper," and "flattering offers"? What happened Mike at last? What good had he done?

Seatwork:

Tell about Mike getting hurt and how he was found and made well. Tell what he learned to do and how he acted when he was set free.

LESSON CVII

Answering a Letter:

Review the chief points to watch in writing a letter. Write on the blackboard a letter that requires an answer. With the help of the class write on the board an answer to the letter, being careful about the heading, salutation and ending.

Seatwork:

Have the children write a letter to friend in the class. See that the pupils are grouped in pairs so that each child will receive a letter. Have the letters folded carefully and mailed in a box in the room. Distribute the letters before four o'clock.

LESSON CVIII

PICTURE STUDY

Funny Horses

Many animals are used in different places for riding as well as driving. In this country we usually ride horses. In some places down south donkeys are used. Over in India people ride elephants, and in Africa they often use camels. In a stampede men sometimes ride cattle to amuse the people. In this picture the children have funny horses to ride. They are really related to the camel, and they are called Llamas. They are found in South America and these two have been brought to the zoo, where they have become very tame. What do you think is funny about their appearance? What animal is the head most like? What sort of bodies have they? Have they long hair or wool?

Seatwork:

Name all the animals used for riding and tell what country each is used in. Name all the animals you can that may be used for driving but not for riding.

LESSON CIX

CONVERSATION STORY

The Wind at Play

Oral:

Talk about some of the tricks Mr. Wind likes to play on us. Talk about it blowing our hats away, scattering papers all over the yard, scattering weeds around the farm, banging the doors ,twisting clothes around the line, and other pranks the wind often plays.

Seatwork:

Write a few sentences telling about losing your hat on a windy day and the trouble you had running after it.

LESSON CX

were - wear - where - we're

Have the words pronounced carefully. Note the difference in sound. Write several examples of the correct use of each. Have the children give some examples orally.

Put in the correct word:

1. _____ you at the party?
2. _____ is my coat?
3. The girl will _____ her new dress.
4. He came close to _____ we _____ standing.
5. _____ going to have lots of fun.
6. _____ will you _____ that pretty flower.
7. I know _____ you _____ yesterday.
8. Mother will be cross if _____ late.

LESSON CXI

STORY FOR REPRODUCTION

Foxey, the black and white fox terrier, opened sleepy

eyes and listened. He was in his own kennel in the warm basement. Why, he wondered, were all those feet flying about in the kitchen overhead, when it couldn't be anywhere near time for breakfast.

He wasn't long finding out, though, for Bobby came flying down the cellar stairs, and over to Foxey's little house. "Come on, Foxey," he cried, "We're all going over the hill for a load of wood, and you are going too."

Foxey jumped up, wagging his short tail, and barking with delight. Up the stairs they raced together. Breakfast was over, and Mother was packing a lunch basket. "We're going to stay all day," explained Bobby. Daddy's going to drive the horses around by the road, and you and Mother and I are going to walk over the hill, and meet him at the spring for lunch. Won't that be fun?

Foxey barked and jumped about to show how glad he was, and very soon they started.

The walk over the hill was very exciting. As they went through pine trees and bushes, and rocks, Foxey dashed about, digging furiously under the biggest rocks, putting his nose down into the hole he made, and sniffing, and then digging some more until Bobby called him to come along.

When they reached the top of the hill, where the spring was, the trees were very tall and thick, and there was Daddy, busily loading the wagon with wood which had been cut and piled long before and left to dry ready for use.

When the wagon was full, they ate their lunch and had a cold drink from the spring, and then rested a bit, while Foxey scurried about, following the strange new smells that came to his keen little nose.

"Time to go home," said Daddy at last. "We'll all ride home on the wood."

Slowly and carefully the big horses drew the load down the wood road through the trees, with Mother, and Daddy, and Bobby perched on top. Foxey ran ahead, here, there and everywhere among the bushes. Jog, jog, trot, trot, went the horses' feet all the way home. Daddy climbed down, Mother climbed down, Bobby climbed down.

"Where's Foxey?" asked Bobby suddenly. They had forgotten all about him. "The last I saw of him," said Daddy, "he was racing around in a meadow alongside the road. He will probably he here in a few minutes."

But Foxey didn't come, and minutes lengthened to hours. It was supper time, and then bedtime, and still no Foxey.

You see, he scampered about in the meadow so long, and went so far, that the load of wood was out of sight when he remembered about it. Worse still, although he put his nose in the air and sniffed and sniffed, he had lost the scent of it. He didn't know what to do for a minute,

then he scampered straight back the way he had come, to the spring. Once there, his wise little nose found the scent of Bobby's feet, and of Mother's, and of his own. With his nose close to the ground he raced away, following, following through the woods the way they had come that morning. No stopping now to dig under rocks. On and on, wherever the scent led, there went Foxey.

Daddy was ready to close the house for the night. He walked out to the road for a last look for Foxey. From the direction of the hill he heard a faint sound, and in the starlight he saw a dim white form. In another moment Foxey was wagging his tail at Daddy's feet.

Gathering him up in his arms, Daddy hurried to the house, where a great welcome awaited the little dog. As soon as he had been fed, Foxey was tucked away in his snug house in the basement, ready for a long night's rest.

Oral questions:

Who was Foxey? What wakened him up one morning? What did he learn from Bobby? What arrangements were made about the picnic? What did Foxey do as he walked along? What work had Bobby's daddy planned along with the picnic? How did everybody go home? What happened Foxey and why did he get lost? Where did he go when he couldn't find Bobby? How was he able to follow without seeing the wagon? How was he received when he got home?

Seatwork:

Tell about a picnic you have had. Tell about the games you played, about preparing and eating the lunch. Tell about one particular thing that happened during the day.

LESSON CXII

Build up new words by adding a few letters to the beginning or end of the words given as:

laugh, laughs, laughed, laughter.
true, untrue, truth, truthful, untruthful.

Build up new words from:

write, happy, please, fast, rain, take.

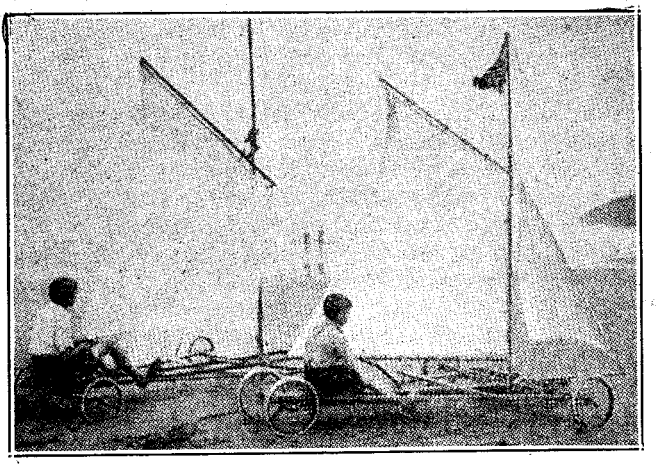
LESSON CXIII

PICTURE STUDY

Sailing on Land

Oral discussion:

Usually we sail on water. Sometimes we make ice boats and sail on ice. Here the boys have made sail cars and are having a good time on the level sands of the lake shore. See how the car is built. It is very much wider in front and built very low.



Why does it need to be built wider in front?
Why is it built low?
How many wheels has it and how are they made as light as possible?
What are the two large sheets?
What do we call the upright pole?
What is at the very top of one?
How many will each boat carry?
How does each boy steer the car?
Must they go only the way the wind is blowing?
What do you think the boys like to do best?

Seatwork:

Tell about making an ice boat or about going for a sail on the lake. Tell how the boat is steered and what you must do to sail against the wind.

LESSON CXIV

CONVERSATION STORY

The Wind at Work

Oral:

From the children's conversation get a list of the things that the wind does to help us. Talk about it drying the clothes, scattering seeds, turning the mills, melting the snow, making sail boats go, and anything else the children may suggest.

Seatwork:

Write a short story telling how the wind helps the farmers. Also tell some ways in which it does a good deal of harm.

LESSON CXV

REVIEW EXERCISES

Their, there, to, too, two, would, wood, saw, seen, broke, broken, threw, through, rode, road

Put in correct word:

1. ..... brother ..... not walk ..... the .....
2. ..... many children were ..... on the bridge.
3. Were the ..... dishes .....?
4. I walked ..... the ..... and down the .....
5. The boys ..... the ball ..... the window.
6. Who ..... that cup and saucer over .....?
7. I .... birds sitting on a tree in the .....
8. John ..... on horseback ..... the field.

LITERATURE SUGGESTIONS FOR FEBRUARY

The Reader—Pages 135-160.
Special Literature—Robinsoe Crusoe, page 143.
Memory—Pippa's Song.
Verses from the Pied Piper.
Stories—Adventures of Pinnochio.
The Golden Staircase (poems).
Dramatization—The Golden Touch.

— A —

Lord Nelson

1. How was Horatio Nelson different from most children when he was small?
2. How old was he when he went into the navy?
3. What was his chief aim?
4. Tell what happened once in the North?
5. What words of his do we still remember?
6. Why do we still remember Lord Nelson?

— B —

An Eastern Legend

1. Tell the story of An Eastern Legend in your own words.

— C —

Robinson Crusoe

1. What did Robinson Crusoe wish to be?
2. What happened on one voyage?
3. Name the things he saved from the wreck.
4. Where did he make his home?
5. How did he know which day it was?
6. How did he spend his time?
7. What did he have for company?
8. How did Friday get his name?
9. How did he get back to England?

— D —

A Nest in a Pocket

1. Where did the bird build her nest?
2. What frightened her?
3. Why did he put the coat back?
4. How long did the birds stay?
5. How could the farmer be a little better for letting the birds stay in his pocket?

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GRADE IV

FEBRUARY OUTLINE

1. Review subtraction.
2. Continue long division with more difficult divisors. (Check).
3. Review unit fractions and division.
4. Teach hour, half hour, quarter hour.
   Problems throughout. Spelling drill.
   Common abbreviations.

Subtraction

73614582	6472416	813624513	51374281
15342645	3858152	347156254	15647327
93145221	73425123	6222371	8341526
37682354	45673489	3687534	3594763
73641233	5167124	5302406	8241034
41585749	2426835	2476547	5678675
7004002	5300020		
2883187	1873562		

Long Division

Type 6—Two-place divisor, the trial divisor being one greater than the first figure of the divisor and the true quotient one greater than the trial quotient.

57)1767

The pupils should be taught to watch the remainder at each step to be certain that it is never larger than the divisor.

Type 7—Two-place divisor, quotient figure apparently unity, but the partial product resulting is too large. Pupil must be practised in trying first 9 and then 8 as a trial divisor.

57)5511

Type 8—Zero in quotient.

204
36)7344

Type 9—Three-place quotient. Pupil will gradually gain facility in using the first two figures of the divisor as a trial divisor.

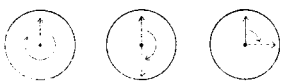
$$379\overline{)25586}\quad 6$$

The teacher should not tell pupils that nine types are being presented. Intensive practice on each type should be followed by drill on mixed types. The pupils acquire unconsciously procedures suited to various divisor-dividend relations.

Hour, Half-hour, Quarter-hour

Here as in all denominate number work the pupils must not merely memorize the tables without appreciating the meaning of each term used. During the course of several days preceding the systematic work on hours, minutes, etc., ask the pupils to note the number of classes conducted or the amount of work done in any hour. The recess period may be their example of a fifteen minute interval, etc. Use an old clock and ask the pupils to count the minute spaces traversed by the minute hand in one complete revolution.

Use blackboard diagrams as aids:



The pupils must memorize the table, but the memorization should follow, not precede an understanding of the relations expressed.

Unit Fractions

A natural setting for the thinking concerning unit fractions is found in the foot-yard, or in the pint, quart, gallon, and hour, half-hour and quarter-hour relationships.

½ hour equals ..... minutes.
¼ hour equals ..... minutes.
1 foot equals ..... yard.
1 pint equals ..... quart.
1 quart equals ..... gallons.
1 pint equals ..... gallons.
½ hour equals ..... /4 hours.

PROBLEMS

1. How many minutes are there in 1 hour? In ½ hour? In 1½ hours?
2. 1 pint of milk costs 9 cents.
   Find the cost of 1 quart.
   Find the cost of 3 quarts.

3. If a man earns 60 cents in 1 hour, how much does he earn in one quarter hour?
4. Gasoline costs 40 cents a gallon.
   How much is this per quart?
5. Find the sum of 24 and 16.
6. Find the product of 24 and 16.
7. Mother had 15 yards of silk. She cut 8 yards from the piece. Which of these statements are true?
   (a) The piece of silk that is left is more than 15 yards long.
   (b) The piece of silk that is left is less than 15 yards long.
   (c) To find how much is left you subtract 8 yards from 15 yards.
   (d) To find how much is left you add 8 yards to 15 yards.
8. A gallon of syrup costs $1.20. One-quarter of $1.20 is 30 cents. What does the 30 tell you?
9. We had ten words in our spelling today. John had two of them wrong. What information do you get when you subtract two (2) from ten (10)?
10. Fill in the blanks:
    15 cents a foot equals _____ cents a yard.
    30 cents a yard equals _____ cents a foot.
    20 miles per hour equals _____ miles per ½ hour.
    50 cents a dozen equals _____ cents per ½ dozen.
    3 pounds for 25 cents equals _____ pounds for $1.00.
    1 pint equals _____ gallon.
    ¼ foot equals _____ inches.
    30 minutes equals _____ hour.
    2½ quarts equals _____ pints.
    In ½ gallon there are _____ quarts.
11. The line ———— represents a road ½ mile long.
    Draw a straight line to represent a road ¼ mile long.

ART

R. W. Hedley, M.A., B.Educ. G. F. Manning, M.A.

GRADE V

The pupil is introduced to cardboard construction in the exercise for this month. In former exercises in paper work he learned the necessity of careful measuring and cutting. He is now in a position to attempt a more exacting evercise, but one which is very delightful.

The Exercise.—The illustration accompanying this article shows the steps in making and decorating an ordinary cardboard box. The materials are two pieces of padding board, of fairly heavy weight, each 6x9 inches; eight pieces of tape or thin cloth about ¾ by 1½ inches, to bind the corners, and a piece of 6x9 cross-lined paper, of ⅛ inch section to cover the lid or cardboard cover. A narrow strip about 1¾ inches wide of the same cross-section to cover the sides of the box is also necessary. Glue may be used, but paste will answer for the little work of this nature that is required.

Preliminary Work.—Since the educational value of such an exercise is to impress on the pupil the necessity of accurate work in measuring, cutting, folding, etc., it would be a good thing if the teacher were to make the box before introducing it to the class. However, if one is quite familiar with such an exercise this precaution may be omitted. A plan should be made, and its accuracy tested out as shown in figure 3. All materials should be ready, as required, and the lessons as planned below should be carefully prepared.

Lesson 1.—Show the class a cardboard model of the box, or another box of about the same size. Let the pupil see the necessity for careful measuring, particularly with such an object having a lid to fit nicely on the box. Explain that it would be a wise thing to make a plan before making the box.

Having previously drawn a plan on the blackboard as shown in fig. 1 and fig. 2, explain the lines and the measurements to the class. How are the cutting lines indicated? How are the folding lines shown? In a cardboard model these folding lines are often called scoring lines, because in bending cardboard, it is necessary to score, with the point of a pair of scissors, just deep enough that the coardboard will bend along the line but will not break.

The members of the class will now make a similar plan or working drawing. Show the pupils how to measure accurately, by raising the back of the ruler and running

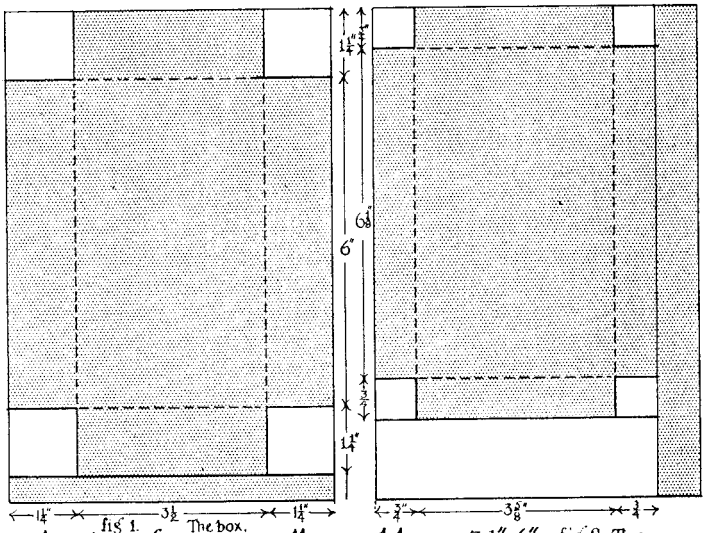


fig 1. The box. fig 2. The cover

A plan for a cardboard box, 3½"×6"

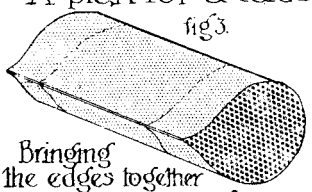


fig 3.

Bringing the edges together to test the accuracy of the measurements.

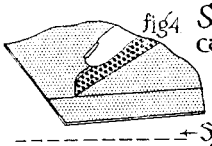


fig 4 Scoring the cardboard with a scissors point

Scoring and folding lines.

Cutting lines.

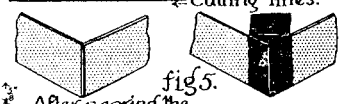
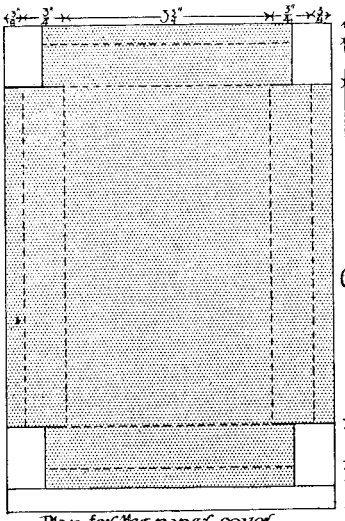


fig 5.

After scoring, the box is bent into shape. and the corners are bound.



Plan for the paper cover.

The plan for the paper to go on the cover of the box is on the right. Use ⅛" cross-lined paper - size 6x9. Cut ⅜" off an end as shown.

Plan an all-over pattern for the top based on T. L E, F or H. In applying draw the two diameters on the cover and work each way from these lines.

Pattern from the letter E.

To construct a cardboard box.

the pencil point down a division line of a ruler. When the plan for the box has been made, have the measurements tested for accuracy by the method shown in fig. 3. If the points on the opposite sides do not exactly coincide, have the measurements made again; one side must be faulty, and probably both.

Lesson 2.—The padding board for the box and the cover each measures 6x9 inches. You will note that part of this, particularly for that required for the cover, is cut away. The problem in this lesson is to measure and cut the box.

The measurements may be taken from the plan, by placing this along the edge of the cardboard and making the transference. Check carefully the measurements before any scoring or cutting is done. In scoring hold the ruler firmly that the point of the scissors will move along the centre of the pencil line. In cutting with a sharp knife on some suitable hard surface, hold the ruler very firmly, and watch that the knife point moves along the pencil line. If this is the first cardboard cutting, it might be a wise thing to try cutting other pieces of padding board before trying that for the box or cover.

When the box and the cover or lid are scored and cut, the sides may be bent into shape. A ruler edge placed along the cardboard on the other side of the scoring line and the sides bent against this will insure a straight bend. Pieces of tape are now pasted or glued at the corners as shown in fig. 5. It may be necessary to hold each corner a few seconds until the paste or glue sets. When the box and the cover are firm, they should be placed aside to dry. As soon as dry, try the cover on the box, as it may be necessary to glue a corner over again.

Lesson 3.—To place a decorated paper cover on the lid of the box. For this purpose ⅛ inch square section paper is used. A piece 6x9 inches will be satisfactory. Note the measurements on the figure in the lower left hand corner. Measure these on your section paper and cut away the corners and along the end as shown. Bend the paper over a straight edge where the bending lines are indicated. Fit the paper over the cardboard lid and try out the measurements.

Lesson 4.—To decorate the cover. The decoration suggested is that made from certain letter forms, as H, E, F, L, T. The designs are based upon the letter "E". The pupil should try to make a unit from another letter. A bi-symmetric unit is suggested. To apply this unit to the paper, first draw lightly the diameters of the paper so as to get the centre of the lid or cover. From this centre work each way, in applying the unit. The decoration will then appear balanced when the paper is fastened to the lid. The decoration may be made with wax crayons, or better yet, a brush

may be used. This makes a good seatwork exercise, and the cover if carefully done is most attractive. A strip of section paper 2 inches wide may be used to cover the sides of the box. A line along the bottom edge will complete the decoration. This should be applied after the strip is pasted into place. The lap should always be made at a corner.

Lesson 5.—Finishing the box. Experience has shown that the best results are obtained when the cover paper for the lid is pasted only along the inside of the cardboard lid. Put the paste along the coardboard, then press the edge of the paper into place. The strip for the sides of the box may be put on in like manner. Fit the strip into place, and crease it for the corners. Paste along the cardboard inside the box. Paste the strip into place, and allow it to set. Then apply the paste to the bottom of the box, near the corners. Then paste down the other side of the cover paper into place.

Seatwork.—Much of this exercise may be done as seatwork. If errors are made, these can be rectified at certain stages. Accuracy and neatness should characterize the finished article.

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GEOGRAPHY

J. M. Roxburgh, M.A.

GRADE VI

QUESTIONS AND EXERCISES

PART A

AUSTRALIA

I. Australasia includes all the islands in the large group lying in the south Pacific. Among the largest are Australia, New Guinea, Tasmania, and New Zealand. Some of the groups of smaller islands in Australasia are the Solomon, the New Hebrides, New Caledonia (French), the Fiji Islands.

II. **Main Features of Australia.**

Size—Smaller than Canada. Compare with Brazil, U. S.A., Europe, etc. Length 2,500 miles. Width 1,500 miles at centre.

Position—In the southern hemisphere, between the Pacific and Indian Oceans. The Tropic of Capricorn passes through the centre of the continent. It is partly in the tropics and partly in the Temperate Zone.

North Coast—Main features: Gulf of Carpentaria, York Peninsula. The climate is warm with heavy rains in summer due to the monsoons. Dense tropical forests cover this area.

South Coast — Main features: The Great Australian Bight, an unbroken coast 1,100 miles long; the island of Tasmania, separated from the mainland by Bass Strait. Climate of the Bight region dry, owing to the lack of moisture-laden winds. South Australia and Victoria have a cool climate with sufficient rainfall for crops.

West Coast—Very dry with the exception of the south, where farming can be carried on.

East Coast—This has good harbors. Along the coast of Queensland is the Great Barrier Reef, consisting of coral.

Surface Features—The highlands are near the shore, as in Africa. The highest mountains are along the east coast, and are called the "Great Dividing Range." In the interior is a great desert.

Drainage—The rivers Darling Murray and Eyre rise in the eastern highland, having their source in the rains from the Trade Winds. Most of the rivers dry up in seasons of drought, or disappear in the sands.

Lakes Eyre and Torrens in South Australia are salt, as are most of the others.

III. **History of Australia.**—The coast was first explored by Captain Cook, 1770. He followed the east coast as far as Torres Strait.

The first settlements were at Botany Bay, near Sydney. Convicts from England were employed as laborers.

The population is about six millions, mostly British. There are only 60,000 natives. They are a dark race of low intelligence. The native weapon is called a boomerang.

IV. **Life in Australia.**

Animals—Most of these are marsupial, or pouched. Examples of Australian animals are the kangaroo, duck-bill, spiny ant-eater, flying foxes, and rabbits. The latter two are destructive to crops. The rabbits were introduced from England.

Birds—The cassowary, the emu, the bower bird, the brush turkey, the bell-bird, etc.

Reptiles — The iguana, crocodile, turtle, poisonous snakes.

IV. **Government.**—This is similar to that of Canada. It is a confederation of six states, each with a capital of its own and with a Dominion capital at Canberra. Learn the states with their capitals, thus—

Victoria—Melbourne; New South Wales—Sydney; Tasmania—Hobart; South Australia—Adelaide; Western Australia—Perth.

QUESTIONS AND EXERCISES

1. On an outline map of the continent print in names of an island, the Barrier reef, two inlets, two straits, the Dividing Range. Show also four cities with good harbors, the desert area, the chief rivers, and lakes.
2. Why is the climate of the north coast (1) tropical, (2) moist. Why do whites not settle there?
3. Why is the west coast dry in its northern and central part, and why moist at the south?
4. Why is the south coast as far as Adelaide uninhabited? What is the nature of the climate farther east?
5. Account for the more favorable climate of the eastern part of Australia. Account for the desert conditions of the interior.
6. Name five animals, five birds, of the continent. Describe one of each, and one reptile. Which are injurious to crops?
7. On an outline map mark the states of Australia, their capitals, and the Commonwealth capital.
8. In what respects is the government like that of Canada? Of what race are the people?
9. Measure the length and breadth of Australia; give its population; compare with Canada, and U.S.A.

10. Show the course of the westerly winds and their effect on the climate. Show the regions in the path of the Trade Winds. Give the effect. Show the region influenced by the Monsoons. Explain why they blow inshore in summer. What are the summer months there?
11. Some pupil should prepare a report for the class on the life of Capt. James Cook. This should include his humble birth, his marvellous advance in mathematical skill, his assistance given to Wolfe at Quebec, his three voyages in the Pacific, and his tragic death. A map of the world should be used to point to the places mentioned in the account.

PART B

Industries and Commerce

I. The chief industries of Australia are: Agriculture, including wheat growing, fruit growing, tropical agriculture; ranching; mining; fishing; lumbering; manufacturing; shipping.

II. Wheat is grown under dry-farming conditions and reaped with combine harvesters. The areas producing wheat are the inland parts of New South Wales and Victoria, and the southern part of Western Australia. The grain is shipped in sacks. (See illustration, page 237). Australia is one of the important wheat exporting countries, shipping over 100,000,000 to the European markets each year.

Fruit raising in Australia—Owing to the warm climate prevailing, fruits are raised wherever the moisture is sufficient. Currants and raisins are now brought to Canada from the inland parts of New South Wales. Apples, pears, peaches, apricots, and plums are grown in Tasmania, and the cooler parts of the mainland. In Queensland, oranges, lemons, pineapples, bananas, are grown.

Ranching—Large areas are devoted to pasturing sheep. The world's supply of wool is derived from Australia. The merino variety of sheep prevails. Cattle are raised in the moist coastal areas. Butter is shipped to England; also wool, mutton, beef.

Tropical Agriculture—Queensland is producing cotton, sugar, tropical fruits. The chief handicap is high cost of labor.

Forests—The trees are gum trees, eucalyptus and pines. Canada sends fir, cedar, and spruce, as well as pulp for paper, these materials being absent in Australia.

Mining—Gold in New South Wales, and Western Australia. Coal and iron in N.S.W., near Sydney. Iridium in Tasmania. Rich copper and lead deposits are found in several of the states, especially South Australia.

Fishing—The coast waters are too warm for the best quality of fish. Turtle, trepang and coral are found on the east coast. Pearls are a product of the north-west coast.

Manufactures—Butter, cheese, condensed milk, boots, shoes, frozen mutton, woollen goods, soap, iron, steel, machinery, engines, automobiles.

Cities—These are the capitals mentioned above. The largest is Sydney.

Transportation—One line of railroad crosses the continent. It traverses the barren region along the Great Bight. Other railways reach inland from each of the great cities.

QUESTIONS AND EXERCISES

1. On an outline map of Australia mark in the states as guide lines, then referring to the map, page 240, show the areas devoted to sheep, wheat, cattle. Merely enclose the areas with a heavy line and print in the names.
2. Indicate the areas suited for fruits of cool climates, those suited for grapes, and those suited for tropical fruits on the above map.
3. Show what forest trees occur. What forest products are sent from Canada?
4. Compare wheat growing in Australia with the industry in Western Canada.
5. Describe the life and work on a "sheep-run" or ranch.
6. What trouble do rabbits cause? What commercial use is made of them?
7. Name the products of the sea in the neighborhood of Australian coasts. Locate each industry.
8. Of what nature is the manufacturing? What are the main products?
9. What mineral products are important? What are obtained from Newcastle, Coolgardie, Broken Hill. Locate these.
10. Give the value of these products: Wool, wheat, dairy products, gold.

PART C

NEW ZEALAND

Position—About 1,200 miles east of Australia. Corresponds in latitude with the Pacific States of U.S.A., and Spain and North Africa.

Area—About half the size of Manitoba.

Surface—Consists of two islands separated by Cook Strait. The surface is mountainous. There are hot springs. Stewart Island at the extreme south is volcanic. The agricultural parts are the Canterbury Plain and the Auckland district. There are many fertile valleys besides.

Climate—Mild and moist, the latter due to the westerly winds and the nearness of the oceans. The east sides are less moist.

People—The natives are called Maoris. They have reservations on the North Island. The white population consists of 1,300,000, mostly of British ancestry.

Birds of New Zealand—Swans, parrots, ducks, the kea, and the kiwi.

Agriculture—Dairying, grain growing, sheep raising, wool production. The products are exported. Fruits of many kinds are grown.

Forest—Principal product, the Kauri pine.

Manufacturing—Lumber, cheese, butter, leather, shoes, frozen meats.

Cities—Wellington on the North Island, on Cook Strait; Christchurch, on the east coast of the South Island; Dunedin, on the South Island, near rich gold fields.

History and Government—Discovered by Capt. Cook. First settlers about a hundred years ago. It is a self-governing dominion like Canada and Australia.

QUESTIONS AND EXERCISES

1. Measure the extreme length and breadth of the islands of New Zealand. Find areas of similar latitude and climate conditions, e.g., Japan, South Africa, etc. What are the prevailing conditions? Would you consider it a desirable place to live so far as climate is concerned?
2. Describe the surface of the islands. Locate the best farming areas.
3. Tell some interesting facts about the Maoris. What is the population of whites and natives?
4. Describe the agriculture of the islands. What products are shipped out? How are meats shipped? (See picture, page 245).
5. What products are sent there from Canada? (pulp, paper, lumber, autos.)
6. What are the chief minerals occurring there?
7. Locate on an outline map Auckland, Wellington, Christchurch, Dunedin, Cook Strait.

PART D

THE OTHER AUSTRALASIAN ISLANDS

New Guinea—Part Dutch and part under Australasian control. Heavily forested. Produces cotton, tobacco, coconuts, coffee, sago, etc.

Solomon Islands—Under British rule. Products: sandalwood, trepang, pearls.

New Hebrides—Under British and French rule. Cocoanuts are exported. The oil is used in America for making toilet soap.

New Caledonia—Under French rule. Produces nickel.

Fiji Islands—British. Produce sugar and cocoanuts.

Sandwich Islands or Hawaii — American. Produces sugar and pineapples.

Philippines—American. Products: Manilla hemp, rice, sugar, cotton, tobacco, gold, tropical fruits.

QUESTIONS

Review as in the text, page 248.

ELEMENTARY SCIENCE

G. R. Rowe

GRADE VII

LESSON IX

WINTER STUDIES

Observation of the Position of the Sun, and Its Effect on Plant and Animal Life

Importance of the Sun to Us.—The earth has very little heat of its own to support the life that is found everywhere on its surface. All life owes its existence to the sun. The heat and light of the sun are the greatest gifts of Providence to this world. When the heat and light of the sun wane there is a period of slowing up in all the activities of living things. This occurs in winter. Also at night, when the face of the sun is hidden from us, most of the animals and birds, as well as other moving creatures, make it their resting period.

The Sun's Rays Are Most Intense at Noonday.—This is because the rays beat down upon the earth straight at that time. At morning and evening the rays are more slanting. They have to pass through a greater depth of atmosphere then to reach us and therefore they lose much of their heat in passing through to us. Also the rays are spread out over a greater surface when they fall slantingly. For these reasons the heat of the sun would naturally be greatest at noon and in summer. It is true that perhaps 1.00 or 2.00 o'clock may often be the hottest part of the day. This is due to the accumulation of heat which continues till well on in the afternoon.

To Show the Changes in the Height of the Sun.—Let the pupils place a stick in the ground where the observations of the length of the shadow may be easily made. Mark the course of the top of the shadow for several days at a time. It will be seen that it is shortest always at 12.00 o'clock and that then the sun is due south. We have here one way of getting the time from the sun, for it is 12.00 o'clock when the sun is due south. We have, however, adopted Standard time which varies slightly in most places from the true sun time obtained in the way we have described. A shadow stick may be made for showing the lengthening shadows of morning and evening. This consists of an upright peg set in a board, and marks are made to show the curve made by the top of the shadow when this board is set in the sun. The board may be placed in a sunny window and kept in a fixed position from day to day.

The shadow stick may be used also to show the lower altitude of the sun in winter and the fact that it is higher in the sky in summer. The effect of this has been explained above, namely, to lessen the intensity of the sun's rays. The result is that we have winter when the sun is low in the southern sky and summer comes when the sun rises higher. In tropical countries the sun is high over head, hence the intense heat of those countries. In the extreme north and south of the globe the sun's rays are slanting. Hence, the climate in the far north and far south, near the poles, is too cold for habitation by man.

Causes of the Seasons.—Why are the sun's rays more inclined in winter than in summer? The diagram shows the reason for this, namely, that the earth is inclined at $23\frac{1}{2}^{\circ}$ from the perpendicular. The inclination of the axis of the earth to the plane of its orbit is the cause of the seasons.

When the earth is in the position of March 21st, the sun is shining vertically over the equator. As the earth moves onward the sun becomes vertical to places north of the equator, bringing greatest heat of the year, i.e., summer to the Northern hemisphere. Meanwhile the Southern hemisphere has winter, owing to the fact that the sun's rays fall least vertically there. Again, at September 23rd, the sun shines vertically over the equator, giving the north autumn and the south spring. The point of greatest heat in the north is the summer solstice, when the position is close to aphelion. The point of least heat in the north is the winter solstice, December 21st, close to the position of perihelion. The commencement of autumn and spring is termed the equinox, the term signifying "equal nights and days."

QUESTIONS AND EXERCISES

1. Distinguish fixed stars from planets.
2. What objection is there to the statement that fixed stars have solar systems of their own?
3. Report here planets you have observed recently and whether you have had them pointed out or have used an almanac or chart. State where they were seen. (Jupiter may be seen often as an evening star in the west. It is the brightest planet.)
4. Define constellation. Name several you have observed.
5. Sketch the Great Bear and Polaris (Pole Star). Name the stars in the sketch. Show the "Pointers."
6. What are zodiac, ecliptic? (Zodiac is a belt 8 degrees on each side of the sun's path—the ecliptic.)
7. Locate and describe Orion and Pleiades.
8. Write a note on Milky Way.
9. What are stars of first magnitude?

Temperature and Weather.—Temperature is measured with a thermometer. Our comfort depends on the tempera-

ture of the air outdoors. This varies from time to time, but in a general way it is warmer each day towards noon and for some time thereafter. The temperature of the air becomes very low in winter, and rises high in summer for reasons which have been explained in the preceding sections.

Weather is the sum total of the changes in the air from time to time. It is not alone the temperature but also the amount of moisture or dryness, sunshine or cloudiness, wind, storm or calm, which we include in the description of the weather at any one time.

Autumnal Weather Changes in Relation to Plant and Animal Life.—As we have already noted, plants meet the change to winter conditions in different ways. The leaves fall from the trees, excepting the evergreens. Annual plants do not survive the winter but leave their seed pods above the snow so that the seed may scatter in the breeze, or the seed may lie on the ground awaiting the coming of spring to waken into life. A great many perennial herbs remain alive below ground in the roots and underground stems, which send up shoots again each year on the approach of warm weather.

Outdoors, the birds begin their migrations to the warm south-land. Some that remain, like the Prairie Chicken and Partridge, are protected from the cold by an earth growth of feathers and by down next the body which keeps out the cold.

The wild animals are now heavily furred. Our northern climate is so rigorous that only the best-furred animals can live. It is after November that the furs of the Weasel, the Mink, the Muskrat, Fox, Lynx and Coyote are prime and are sought by the trappers. Rabbits change color to agree with the white surroundings for protection. So also do the Weasels. On the farm, the animals grow shaggy coats of hair to keep their bodies warm, but they are generally shut up in stables or pens to give them extra protection, and for convenience in feeding.

The Thermometer is the instrument which we use to detect the intensity of heat. The ordinary thermometer is simply a glass tube with a bulb at the end which is commonly filled with mercury. Mercury is well suited for this purpose as it shows considerable expansion with increase in heat and a corresponding decrease in volume when exposed to cold. When the temperature rises the mercury expands and is pushed up in the tube; when the temperature lowers, the mercury contracts and sinks in the tube. Behind the tube is a graded scale by means of which the temperature may be read. There are two kinds of scales in common use and on both scales the unit of temperature is called the degree (°).

The scale most commonly used in scientific work is the Centigrade. On this scale zero or 0° is marked as the temperature at which ice begins to melt and 100° is taken as the temperature at which water boils at sea level. One degree Centigrate, therefore is one-hundredth part of the distance the column of mercury expands between the freezing and boiling points of water.

The common household thermometer uses the Fahrenheit scale, named after the German scientist who invented it. He found that by mixing ice water and salt he could reach a temperature much lower than the freezing point of water and this point he used as the zero on his scale. On this scale the freezing point is 32° and the boiling point of water at sea level is marked 212°. One degree (1°) on the Fahrenheit scale then is 1/180th of the distance the mercury rises between the freezing and boiling points of water.

QUESTIONS AND EXERCISES

1. When in the day is the sun highest in the sky? Show by means of a shadow stick or marking the shadow of a pole or tree in the yard that the sun is highest at noon. In what direction is the sun at noon?
2. Show how you would set your watch correctly at noon using a compass and a shadow-stick.
3. When during the year is the sun lowest in the sky at noon, and when highest? What effect on the temperature has the height of the sun above the horizon? How may this be shown by the facts of geography?
4. Why is the heat of the sun more intense the higher it is in the sky?
5. What items would you mention in a description of the weather on any particular day?
6. What are the changes these undergo in preparation for winter: (a) deciduous trees, (b) animals, (c) wild birds?
7. What is the purpose of a thermometer? Why does the column of mercury rise when the thermometer is placed in a warm place? What is the freezing point on the Fahrenheit scale, on the Centigrade scale? What is the boiling point of water on each scale? Show these by a picture or drawing of a thermometer, dividing the space between each into spaces of ten degrees each, and printing in the figures. Why is zero on Fahrenheit a lower temperature than zero Centigrade?
8. For what purpose is each type of thermometer scale used? When we say that body heat is 98°, which scale is this? When we say it is 40° below zero, which scale is meant (Ans., either)? When we say that ice melts at 32°, which scale is meant?

9. Why is the Centigrade scale used in science rather than the other? Which is more convenient, a scale divided into hundredths (Centigrade) or one divided into one hundred and eighty parts (Fahrenheit)?

LESSON X

LATE FALL AND WINTER STUDIES (Continued)

Expansion Due to Heat, Freezing of Water

To Show that Air Expands when Heated.—Take an empty flask or bottle closed with a stopper in which is inserted a glass tube three to six inches in length. Hold the flask inverted with the tube under water. Now heat the flask gently with the flame of a lamp. Observe that the air bubbles out of the flask, showing that it has been expanded by the heat. Now cool the flask with water poured over it. Observe that the water runs up the tube into the flask. This is due to the contraction of the air by being cooled.

We can see examples of the facts we have illustrated above in the ordinary things around us. If auto or bicycle tires when fully inflated are allowed to stand in the sun, the expansion may cause the tires to burst. Tightly closed cans or bottles should not be subjected to heat lest an explosion may result.

Water Expands When Heated.—This may be shown with the same flask used in the previous experiment, but filled with water and held mouth upwards. Heat this gently over a lamp or on a stove. Observe the immediate rise of the water in the tube, showing expansion of the water.

To Show that Iron Expands when Heated.—Special apparatus may be purchased for this experiment. An iron ring is provided through which a perfectly spherical ball of iron passes but fits closely. Now heat the iron ball and it will be seen that it will no longer pass through the ring owing to its increased size after expansion.

Applications of this fact are seen on every hand. When water pipes or gas pipes are laid, allowance must be made for expansion and contraction. This is done by means of expansion joints, which are merely jogs in the pipe. Railway steel must be spaced apart at the ends to allow for expansion. Steel bridges are built with expansion joints. Wires on telegraph poles or transmission lines should not be drawn too tight if placed in summer, lest the contraction due to cooling in winter snap the wires.

The expansion due to heat can be made visible to the eye. Heat the end of a wire in a flame to red heat. Observe the greater thickness of the heated part.

Changes in Water When It Freezes.—Pupils will already have observed that vessels filled with water left exposed to low temperatures are burst by the expansion of the ice.

Some results of this are observed in the bursting of water pipes when they are frozen, the bursting of auto radiators by frost, etc. Water increases 10% in volume in turning to ice.

Why Ice Floats on Water.—This is explained easily following consideration of the facts stated in the preceding section. Naturally a cubic foot of ice is lighter in weight than a cubic foot of water, and therefore as the ice is lighter than the water, it floats. This is of some importance to us all. It would be a strange state of affairs if ice were heavier than water as it would sink to the bottom and more would form and sink, and so on. Thus soon the whole of the lakes and rivers and oceans would be solid ice in the colder parts of the world, and it is doubtful if they would ever melt entirely in summer. Also, we would have no ice to skate on under these conditions. With ice on the surface always, the lower depths of the lakes are never frozen and thus fish are free to swim about all winter, and on the coming of summer the ice, being at the surface, is soon melted.

Ice Crystals.—Ice is solidified and crystallized water. Water crystals may be seen in the snowflakes. Observe some newly fallen flakes by means of a microscope, letting them fall on black cloth to show up the white points of the crystals. Observe that they are six-pointed always, although all are not of exactly the same form. Ice crystals are seen also on a frosted window, but here the six-sided nature of the crystals is not apparent. Look for crystals also at the edges of the ice while it is forming in a vessel.

To Find the Freezing Point of Water.—Place a vessel containing water outdoors in freezing temperature. Leave a thermometer standing in the vessel. Observe the temperature when freezing begins. It will be found to be 32° on the Fahrenheit scale. Test in the same way, using a Centigrade thermometer. Here it will be found to be 0°.

To Show That the Melting Point is Also the Freezing Point.—Mix broken ice or snow with water and stand indoors with a thermometer in the vessel. Observe the temperature. It is 32° on the Fahrenheit scale and 0° on the Centigrade scale. It is apparent that we may have water at 0° C. and also ice at 0° C. and to change the latter to the former condition heat is needed.

To Account for the Heat Lost When Ice Melts.—It is a little difficult for children to believe the statements that we are going to make in this connection. It is, however, true that heat is lost when ice melts, and that this heat is given back when the water freezes again. We can show this by a simple experiment. Suppose we place in a vessel some dry broken ice or some snow. Observe the temperature of it, (which in an ordinary room is 32° Fah. or 0° Cent.). Now add to this a small quantity of warm water, noting first its

temperature. Perhaps it will be 60° Fah. Now stir the mixture. It will be seen that the mixture is still at 32° Fah., and the heat of the warm water has entirely disappeared. To show the converse fact that ice in freezing gives off heat is a little beyond the limits of our study here.

Other Solids Become Liquid When Heated Sufficiently. —Heat some lead in a spoon over an alcohol lamp. Observe it soon becomes liquid. Let it cool again, and the lead freezes to the solid condition. Melt wax, tallow, or solder in the same way.

QUESTIONS AND EXERCISES

1. Show by a simple class-room test the fact that air expands when heated.
2. How would you show with the same apparatus that air shrinks into smaller space on being cooled?
3. Why do inflated tires of automobiles sometimes burst on hot days?
4. Why do balloons inflated with hot air tend to rise? Why do such balloons come to the ground after rising for some time?
5. Show by an experiment that water expands on being heated.
6. What liquids are used to fill the tube of thermometers? What evidence is there that these liquids expand with heat? Show that they contract on being cooled.
7. Show that iron expands on being heated.
8. Parts of the piston of automobile engines are made of a metal "invar" which does not expand or contract; what advantage is there in using this metal?
9. Why do telephone wires sag in summer? How are tires tightened on the rim of wagon wheels? Why does use of heat loosen the stoppers of bottles or jars? Why are steel rails spaced apart at the ends? What would happen if they were not? Give other examples of the application of the principle of expansion.
10. Why does ice float on water? What would happen if it did not?
11. Draw figures of ice crystals seen in snowflakes. How many points has each?
12. Show other means of proving that ice is crystalline.
13. Show how to find the freezing point of water. Picture the simple apparatus used.
14. Prove also that the freezing point of water is the same as the melting point of ice.
15. Show that heat becomes latent or lost for a time when ice or snow melts.
16. Try to liquefy other substances than ice. Name some such substances. Can these be liquefied: chalk, gold, coal, granite, wood, glass?

LESSON XI

LATE FALL AND WINTER STUDIES (Continued)

Evaporation, Humidity

Evaporation.—The air at all times contains quantities of water in the form of invisible vapor. This moisture comes from the surface of the moist ground, or from the surface of lakes, rivers, oceans. The process by which the liquid thus turns to an invisible form of moisture in the air is called evaporation. All liquids evaporate to some extent, but some much more than others. We all know it as a fact that gasoline, when exposed to the air, evaporates more rapidly than water, so also pure alcohol, or ether, or chloroform, when exposed in an open vessel, soon completely vaporize. Other liquids evaporate slowly, as, for example, oils.

Conditions Hastening Evaporation.—The pupils' own experience will show many of the facts under this head to be true.

1. Heat hastens evaporation. Water in a vessel disappears most rapidly when heat is applied, especially if the water be boiled continuously till dried up.

2. A large surface exposed to the air hastens evaporation. Closed vessels prevent it. Wet clothes spread out on a line soon dry by evaporation of the moisture. Clothes folded in a bundle would not dry out at all.

3. A current of air aids evaporation. Clothes dry in the wind. Often an electric fan is used indoors to hasten the drying of materials.

4. Drying depends on the amount of moisture already in the air. If the air is moist there is slow evaporation. In dry weather water evaporates more rapidly.

Sublimation.—Often evaporation takes place from the surface of ice. In such cases, the ice does not turn liquid at all. This is called sublimation. It will have been observed that sometimes wet clothes are hung on the line in winter and soon become frozen, nevertheless the clothes will dry out. Evaporation takes place continually from the surface of ice and snow. A lump of ice exposed for days in zero weather will present a rounded appearance where the angular corners have turned to vapor in the air.

Condensation.—This is the opposite process to evaporation. It is the recovery of moisture from the air into the liquid form as water. An example of this is shown when a cold plate of glass is held in the steam from a kettle of boiling water. The moisture appears in the form of water drops on the cold plate.

A second experiment will show the presence of invisible vapor. Pour ice-cold water into a glass pitcher or tumbler in a warm room. Observe the film of moisture on the out-

side. Plainly this could not come from within the pitcher, but must have been formed by condensation from the moisture in the air. This experiment succeeds best in summer, or in winter where the air of the room is kept moist.

Dew and Hoar-Frost.—Dew is formed on the grass and on any objects that have been left out in the night air in summer. The principle under which it is formed is that illustrated in the foregoing paragraph. As the surface of the ground becomes cool at night, the moist air in contact with it is deprived of its moisture by condensation. If the ground becomes cooled below 32° Fahrenheit, the moist vapor is frozen as it forms and we have white or hoar-frost. All of these phenomena are to be observed in the summer months, especially in the later months when the nights are long. Then the dews are heavy, and sometimes frost occurs. They will not occur on cloudy nights because the clouds prevent the heat from leaving the ground. Also winds prevent dew and summer frosts because they keep the air mixed and so none gets particularly chilled.

The Water Cycle in Nature.—Our rivers are continually running toward the sea and they are continually receiving more water from rains. Yet the sea gets no larger in spite of the immense volumes of water pouring into it. Water follows a cycle. It rises from the seas and lakes and the moist earth, as we have seen, by evaporation. The moisture-laden air is carried by the winds to the high mountains far from the sea. Here it falls in the form of rain or snow when it is condensed. Thus the streams are continually fed, and they "flow on forever," as we are told in the poem about the brook. The Saskatchewan river is fed from the great ice-fields in the Rockies. The Red, Assiniboine and Winnipeg rivers are fed by rains and melting snow. Most of the rain and snow that feed these streams comes from the ocean carried by winds as invisible vapor or as clouds.

QUESTIONS AND EXERCISES

1. What is meant by the term "water vapor"?
2. Where does the vapor of the air come from? What liquids will evaporate more readily than water?
3. Under what conditions will evaporation take place most readily? Show by examples a proof of these.
4. Why will water evaporate from one's hand more rapidly than from a moist cloth? Why will clothes dry more readily in the sun than in the shade? Why more readily when hung out at full length than when folded? Why do they dry better on windy days?
5. Show examples of evaporation from water after it is frozen. Does evaporation take place from the snow-fields of the north?

6. What forms of moisture are there in nature due to condensation of water vapor? Where does the moisture come from that reaches us in the form of rain or snow? How is it brought to us?
7. Describe a simple experiment to show the principle of the formation of dew. Show how steam may be condensed. How is distilled water prepared?
8. Under what circumstances is hoar-frost formed? Why is it usually late in summer?
9. Why is dew absent on cloudy nights? On windy nights?
10. Show that water in Nature is going in a circle. Why does the brook "go on forever"?

LESSON XII

LATE FALL AND WINTER STUDIES (Continued)

Water Supply

Importance of Water.—Water is one of the prime necessities of life. All plant and animal life depends for its existence on water. It is the most important requirement in practically all industries, and it is a most serious problem to supply it in adequate amounts and of purest quality for farm houses and for towns and cities.

Sources of Supply.—On farms, the supply is derived from wells or from springs, occasionally from lakes or streams. In cities, long pipe-lines are needed to bring in the supply and distribute it. Usually the source is a nearby stream or a large lake. Often a reservoir must be built on high ground where the water is allowed to lie in an open pond so that sediment, including the bacteria that cause disease, are allowed to settle to the bottom.

Children should learn to beware of drinking from sources of water supply which may be contaminated. One should never drink water from open streams where these flow through settled districts. Shallow wells are often kept supplied with water from the surface of the ground after rains, and such water is unfit for use, unless previously boiled. The particular danger in water from such sources is typhoid fever, a disease which is often fatal.

Filtration.—Water in springs is naturally filtered, that is, it has passed through many hundreds of feet of sand or gravel and the impurities which might harm us are all sifted out of it. Water for cities is sometimes passed through a sand bed for the purpose of purifying it. Water suspected of not being safe for drinking purposes should be boiled and allowed to cool before being used. In this way the germs of disease will be killed.

Lime an Impurity in Water.—Look at the deposits of hard material on the bottom and sides of a tea kettle. Here we have an example of the effect of hard water. The scale

we see in the kettle consists of mineral matter dissolved in the water while it was moving through the soil or through sand or gravel. Usually it consists of lime, that is, the same material as limestone, or the shells of oysters, eggs or snails and similar substances. A small quantity of carbon-dioxide in the water helps to dissolve these substances very much faster. On heating the water containing lime in solution the carbon-dioxide is driven off. Then the lime settles to the bottom. As explained above in this lesson, one method of softening hard water containing lime is to heat the water.

Lime scale forms in boilers and water pipes and is very inconvenient at times.

An experiment to show that rain-water or snow-water contains no mineral in solution may be performed by heating snow-water in a clean glass vessel and allowing it to boil until all has evaporated. Evaporate, in the same way, rain-water, well-water and water from an alkali pond. It will be observed that the rain and snow-water show no mineral sediment while the others show white limy residue.

Similarly experiment with distilled water and water in which salt has been dissolved.

Distillation.—Take an alcohol lamp and a flask containing a small amount of water, the top of the flask being closed with a rubber stopper in which is inserted a bent tube of glass. Boil the water and note how the steam condenses in the tube. By cooling the tube with cold cloths the steam may be recovered as water. The salts or lime remain in the flask. This illustrates the principle of distillation by which water almost perfectly pure may be obtained.

Water as a Solvent.—Perfectly pure water is difficult to obtain. Even rain-water has dissolved in it substances from the air, as may be noticed from the smoky taste. As we have already noted, the minerals in the soil, especially limestone, are taken up in solution by water and thus all water derived from the earth, as in springs or wells, has usually a considerable mineral content. Salt is readily soluble in water; so also are many mineral salts, such as saltpetre, copper sulphate, sal ammoniac, and others that may be named. The metals and most of the rock materials of the earth are only slightly soluble.

QUESTIONS AND EXERCISES

1. Examine the bottom of kettles where water has been boiled in them. What is the substance you see there and where does it come from? Why does boiling the water cause it to leave this deposit?
2. How is the purest water obtained? How can you tell from appearance and taste that rain-water is not pure? What are the impurities?
3. Evaporate some samples of water over an alcohol lamp

or a hot stove, using a clean glass vessel in each case. What do you observe in the case of distilled water, of rain-water, of slough water?

4. Water derived from districts in which there is no limestone is almost completely soft as in the case of the water supply of the city of Winnipeg. What advantage is the use of such water in the house? In the factory? Name industries in the city where the use of such water is an advantage (laundries, etc.).

5. What is a filter? How is spring water or well-water naturally filtered? What is the danger of using unfiltered water of a creek or shallow well? What is the danger in contaminated water? Why is the water from a large stream or lake usually safe to use? What care must be taken to keep the wells from which drinking water is taken free from bacteria of disease? How may water be treated to make it safe to use?

LITERATURE

C. S. Edwards, B.A.

GRADE VIII

THE ISLES OF GREECE

Authorship.—This poem was written by Lord Byron, an English poet who was born in London in 1788, and died while fighting for the Greeks in their war for Independence against the Turks, 1824. He was thus only 36 years of age at his death. He wrote several long poems, among them Childe Harold, Manfred, and Don Juan. This poem is a selection from the last of these. It shows Byron's interest in the war for Greek freedom. As we read the poem we are supposed to be listening to the song of a Greek poet of great fame who is desirous of inspiring the Greeks to think of their splendid past and to make an effort to assert some of their ancient warlike spirit.

The notes on the poem, page 180 in the text, will explain many of the allusions to ancient Greek history, and they should receive careful attention.

Analysis of the Poem.—The pupils may read the poem through silently and rapidly to try to get the aim of the speaker. It is plain that he thinks the modern Greeks have little of the noble spirit of their ancestors. They are more inclined to frivolity and merry-making than to fighting against their tyrant rulers. In a general way the following division of the poem may serve for purposes of study:

A. Stanzas 1-4: Some of the great facts in Greece's historic past.

B. Stanzas 5-15: The shameful contrast of present day Greeks with her past.

C. Last Stanza: The bard is overcome with despondency.

Summary and Notes.

The Isles of Greece consist of many rocky volcanic islands in the Aegean Sea, which lies between Greece and Asia Minor. (See map in the P.S. Geog., page 124). Many of these are of historic importance. "Burning Sappho." She wrote love songs. She lived on the island of Lesbos. Delos is an island in the Aegean which tradition among the Greeks said had arisen out of the sea. It was famous for its oracle of Apollo where the treasure was kept for the Delian League. Phoebus is the sun-god Apollo. The sun rose to the east among the Greek islands. "Eternal summer" has reference to the warm, sunny climate. "All ex-

cept their sun is set," the Greek greatness has passed away, although the sun is there as before.

Stanza 2.—The Scian muse is Homer, who was born supposedly on the island of Scios. "The Teian muse" is Anacreon, a Greek poet, who wrote drinking songs. The "hero's harp" has reference to the Greek heroes of Homer's poems. "The lover's lute" is a reference to the songs of Anacreon, a lute being a small musical instrument like a harp. "Have found the fame" means the appreciation of these poets is now only in western Europe, or perhaps the reference in "farther west" is to America. "The islands of the Blest" the Greek Paradise, probably the islands on the African coast in the Atlantic.

Stanza 3—The allusion in this stanza is to the battle of Marathon, where one hundred thousand Persians were defeated by ten thousand Greeks led by Miltiades. The battlefield was on the sea-coast about forty miles across the country from Athens.

Stanza 4—Here the reference is again to a victory over the Persians, this time a naval battle fought in the neighborhood of Athens. The Persians had 1200 war vessels and an army of over eight hundred thousand men. These were of such a variety of origins that a writer has called the army an "ethnological museum." "Sea-born" is an allusion to the fact that Salamis is surrounded by the sea, and according to legend rose from the sea.

QUESTIONS—STANZAS 1-4

1. What great men and women of ancient Greece are mentioned here? (3). What great events? (2).
2. Explain the circumstances under which the poem is supposed to be spoken? From what longer poem is it selected? Does the poet mention himself? Is there any appearance that the poem is part of a larger one?

NOTES—STANZAS 5-10

Stanza 5—The bard says that the Greeks no longer produce great poets, or heroes. "Lyre" means harp, and is used to signify poetry. "Day" means song.

Stanza 6—"Dearth of fame" means the scarcity of great men. "Fettered race" has reference to the government of the Turks which was very harsh.

Stanza 7—The speaker says that it is patriotic to feel ashamed of the low position to which his country has come.

Stanza 8—Thermopylae is the name of a battle in the

Persian wars where three hundred Spartans held in check the whole Persian army until all had perished.

Stanzas 9-10—The poet deplores the fact that there seems to be not a single hero in Greece to respond to his call to fight for freedom. The people are content to let the Turkish hordes win the battles, while they spend the time in drunken revelry. "Samian wine" is wine from the island of Samos in the Aegean. "Blood of Scio's vine"—the juice of the grapes on the island of Scio, famous for its wine. "Bacchanal"—one who participates in a drunken dance.

QUESTIONS

1. From what you have read about the struggle of the Greeks for independence, what statements seem to be unfair to the Greeks here? If this is so, what purpose is there in the strong language used?
2. Explain the simile in line 45, and the personification in stanzas 5 and 7, and also in line 52.
3. Explain the reference to Thermopylae, Samian wine, Turkish hordes, Bacchanal.

NOTES—STANZAS 10-16

Stanza 10—"Pyrrhic dance"—a Greek dance in imitation of the motions of persons fighting. "Pyrrhic phalanx"—a form in which men were massed in fighting, used by Pyrrhus in fighting the Romans. "The letters Cadmus gave"—the alphabet of Greece was increased by sixteen letters borrowed from the Phoenicians, supposed to have been brought by Cadmus.

Stanza 11—Anacreon, born in Teis, (line 7), wrote drinking songs. Polycrates was tyrant of Samos.

Stanza 12—The Cheronese is the peninsula now called the Crimea, on the north coast of the Black Sea. Later Miltiades led the Greeks against the Persians at Marathon. "Such chains as his . . . bind" probably means that the ruler being of their own race would be more acceptable than the Turks. The word "tyrant" in Greek history means one who had seized supreme power, and had overthrown the existing government. Often the tyrant rulers gave the people good government.

Stanza 13—Suli's rock and Parga's shore are places on the west coast of the Balkan peninsula, on the Adriatic, where the inhabitants in Byron's time defended themselves with great courage in the war with the Turks. "The Doric mothers"—the Spartan mothers had a high idea of patriotism. They prided themselves on the heroic deeds of their

husbands and sons, and their exhortation to the men when they went to battle was: "Return with your shields or on them." "The Heracleidan blood" refers to the claims of certain tribes in ancient times to have been descendants of the legendary hero, Hercules.

Stanza 14—"Franks"—the French. "A king who buys and sells"—Louis XVIII. France, Russia, and Austria had formed the Holy Alliance, and proposed that Greece should be a principality under a Greek ruler, subject to Turkey. This is here denounced by Byron. "Latin fraud" is a further reference to the French policy. "Break your shield" means deprive you of the chance of gaining freedom.

Stanza 15—The bard notes again the fondness of the Greeks for their favorite wine from Samos and for dancing. He thinks it a shame that the children of these women should be slaves.

Stanza 16—"Sunium" is a cape near Athens on which there is the ruin of a marble temple. "Swan-like"—Swans, although among the most handsome of birds, have no power of song. There is popular supposition that they sing only at death.

QUESTIONS

1. Explain the following: Pyrrhic dance, Pyrrhic phalanx, tyrant, Doric mothers, Heracleidan blood, a king who buys and sells, Latin fraud, Sunium's marbled steep, mutual murmurs, swan-like.
2. Explain these:
   (a) "Of two such lessons why forget the nobler and the manlier one."
   (b) It made Anacreon's song divine.
   (c) He served—but served Polycrates.
   (d) O that the present hour would lend another despot of the kind.
   (e) And there perhaps some seed is sown the Heracleidan blood might own.
   (f) In native swords and native ranks the only hope of courage dwells.
   (g) Dash down yon cup of Samian wine.
3. Explain from what you read in this poem what qualities showed the Greeks to be unworthy of their past history.
4. Find Missolonghi on the Gulf of Corinth, where three years later Byron died in the Greek camp fighting with them against the Turks. Find Parga and Suli farther north along the coast. Parga had never really been subdued by the Turks.

5. For what are these famous in ancient Greek history: Pyrrhus, Pyrrhius, Cadmus, Anacreon, Miltiades, Samos.
6. Memorize the first four stanzas of the poem.

TIMON OF ATHENS

This story taken from "Tales of Shakespeare" is the work of Charles Lamb. The collection of tales were in the first place intended for reading by children as a preparation for the study of the plays as Shakespeare wrote them. The tragedies, of which this is one, are understood to have been placed in this prose form by Charles Lamb, while the comedies, like Twelfth Night, were done by his sister, Mary Lamb.

Timon was an Athenian prince who lived about 500 B.C. Deeply hurt by the selfishness of his supposed friends, and their ingratitude, he became a hater of all human kind. One person only, his servant Flavius, proved true to him throughout.

Analysis of the story:

I. Timon when he was prospering. (Pages 1-4 approx.)
II. Timon finds his companions ungrateful. (Pages 5-8 approx.)
II. Timon's abandonment of society. (Pages 8 to the end.)

EXERCISES ON DIVISION I

1. Note the various ways in which Timon dissipated his wealth. Make a list of these, or underline them in the text—an open house, continuous feasting, rewarded poets, bought costly jewels and cloths, paid the debts of young nobles, gave extravagant gifts in return for smaller ones, gave a servant a fortune at his marriage, etc.
2. Briefly tell what part these have in the story—Ventidus, Lucullus, Flavius.
3. Was Timon at this stage of his career looking for popularity, or was he just generous?

Division II.—Timon was reminded by his servant that he had scattered all his wealth. He therefore sent word to those who had received most from his generosity that he desired some return for this. Lucullus, the first to be appealed to, atempted to bribe the servant to say he was absent. Lucius said he had just spent the last of his money. The others had similar excuses. Timon found now that his former friends now avoided his house. He prepared a mock feast, invited them all, and then scornfully drove them from his presence.

QUESTIONS

1. How was Timon warned of the end of his fortune: What shows that the servant felt it keenly?
2. Why should these have been grateful to Timon: Lucius, Lucullus, Sempronius, Ventidus. Which was the most ungrateful? Why?
3. Show the extreme that Timon's creditors forced him to.
4. Describe the last feast of Timon, and the treatment the guests received.

Division III.—Timon betook himself to a cave near the sea-shore, where he lived on roots, and where he lived naked among the wild beasts. He found a treasure in the earth, which he gave to some passing soldiers, asking them to repay him by massacring the population of Athens. Flavius would have befriended him, but he would not hear of it. The lords of Athens came to ask him to save their city from the soldiers. His only reply was to invite them to hang themselves on a nearby tree. He died, a man-hater still, and on his tomb was inscribed his desire that a plague might consume them all.

QUESTIONS

1. What did Timon do following the feast?
2. Describe the incident of the finding of the gold.
3. Show how he treated the faithful Flavius.
4. Describe his interview with the senators.
5. Describe his death and burial place.
6. Tell the story of Timon of Athens in 10-15 lines.

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